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Electrical World

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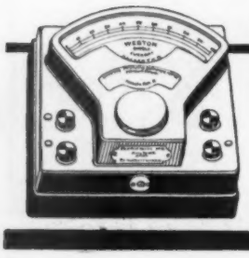

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Electrical World

THE CONSOLIDATION OF ELECTRICAL WORLD, ELECTRICAL ENGINEER AND AMERICAN ELECTRICIAN

Published by McGraw-Hill Company, Inc.

W. H. ONKEN, JR.

Editor

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Muscle Shoals Power Soon a Reality

DELAY means nothing to Congress. If taken to task for inaction, the usual rejoinder is that "after further deliberation, and in the light of additional information, proposed legislation is perfected and proves to be better than that which failed." It is a good excuse and in many instances true. However, in the case of Muscle Shoals, the joke is on Congress, because the hydro-electric plant there will actually be generating electricity before Congress can determine what disposition shall be made of it. It can be truthfully said, nevertheless, that to Muscle Shoals greater consideration was accorded during the Sixty-eighth Congress than to any other one measure. It ran the gantlet of both House and Senate, was freely discussed and amended, subjected to propositions and counter-propositions, and then, when Congress could not agree, it washed its hands like Pontius Pilate and suggested to the President that a commission study the question in all its various phases so that in the light of this commission's report Congress might legislate wisely.

Meanwhile, what is to become of the electricity? Will the water stored by the Wilson Dam be permitted to run to waste? Hardly. With the country "fed up" on Muscle Shoals, use must be found for the electricity. Economy is the watchword of the present administration. Fortunately, the power companies in the district, abused and maligned as they have been, will gladly demonstrate to the country that they can render good for evil by relieving the government of embarrassment and distributing whatever electricity is generated throughout the Southeast. Incidentally they can also demonstrate that they are the best fitted and equipped to make Muscle Shoals what it ought to be, a benefaction to the people of the South. Muscle Shoals will generate electricity in July. Congress will assemble again next December. A four months' demonstration ought to convince Congress what it ought to do with the electric power.

Economy the Guide in Hydro-Electric Development

MOST of the readily available and cheaply developed water powers have now been harnessed, and there remain chiefly those at a distance from loads and those involving a big outlay for development. Designers of hydraulic and electrical equipment have done wonders, so that waterwheels of 92 per cent efficiency and generators of 97 per cent efficiency are available under best conditions.

In the face of rising prices and the increased cost of water-power developments the important element in further progress is economy. Steps have already been taken to reduce the cost of generating stations by changing the design of the monumental and costly superstructure whose purposes are to afford shelter, supply a craneway and decorate the landscape. Outdoor generators are not so readily used as outdoor breakers or transformers, but certain modifications, such as a steel-structure craneway, unit generator houses with removable roofs, sheltered or remote-operating control rooms and other departures from historic practice, can often be used to advantage.

But still greater need for economy lies in the hydraulic works which represent the largest part of the capital outlay. Dams, forebays, pools, tunnels, penstocks, draft tubes and tailraces are major elements which can be carefully studied for each development in order to produce power at a minimum cost. Moreover, it is often unnecessary to build a stream-flow development with the same degree of refinement and reliability as a firm-power development having no steam reserves. Economy and mechanical efficiency sometimes do not go together, and engineers will do well to consider both elements very carefully in developing water powers.

The Chicago, Milwaukee & St. Paul Receivership

BECAUSE it reached out to the Pacific in anticipation of a continued growth in the Northwest which did not materialize, one of America's premier railroads, the Chicago, Milwaukee & St. Paul, is in difficulties. This is of interest to the electrical industry because the St. Paul had the longest stretch of main-line electrified road in this country. There are those who attribute its failure to this fact. Certain it is that the receivership will not be without effect on the electrical industry, for reactionaries, who are constantly fighting off the inevitable, may now shake their heads and in a lamentable voice reply to advocates of railroad electrification: "See what it did to the St. Paul!"

Fortunately, an analysis of the comparative costs of steam and electric operation made by the St. Paul a short time ago showed a net economy of more than twelve million dollars since 1916, or nearly 80 per cent of the total cost of the change from steam to electric power. The failure to make the railroad pay cannot, therefore, be attributed to its electrification. Nor is it due to any fault of management. The trouble arose from the unbounded enthusiasm of the men who pushed a railroad through a new country, paralleling two older railroads, when traffic did not justify such an expansion of railroad facilities. The savings in operation made possible by the electrification of the mountain division enabled the St. Paul to survive just so much longer. Electrification, however, could not compensate for lack of traffic, nor could it save the St. Paul any more than it could have saved the Grand Trunk Pacific and the Canadian Northern in Canada had they turned to electrification in the hope of making their Pacific divisions successful. Electricity can work wonders, but it cannot do the commercially impossible.

Sales Opportunity and Obligation

IN ITS entire history the electric light and power industry has seldom been confronted by conditions so favorable as those now existing to a broad-gage commercial effort to increase the sale and use of electric service. Everywhere citizens have grasped the fact that modern life is largely bound up in electric service and are looking to it for comforts, conveniences and pleasures. By adopting and carrying out since the war a construction program at once enterprising and safe the industry has met an enormous cumulative demand for service. In doing so it has wisely provided additional plant and capacity for more sales, because the public need grows constantly.

Thus there exist both an opportunity and an obligation. The opportunity lies in the possibilities for larger sales of service to every industrial plant, every merchant and every home in the country. The obligation lies in the industry's implied promise to satisfy the nation's clamor for electrification. This promise can be fulfilled by a comprehensive sales program looking to a larger use of electrical energy by existing customers, thus making available to all the maximum benefits of superpower plants, superpower systems and interconnection. These results will be obtained if the industry puts its selling shoulder to the wheel and makes a careful canvass of the market possibilities.

Every present user of electrical energy can intensify his employment of it. Utility representatives can be of invaluable service to industrial customers in helping to solve their manufacturing problems by the installation of automatic electrical equipment which will increase the number of productive hours of operation, thus making such customers larger users of power. There are possibilities of developing or attracting twenty-four-hour chemical loads which, if advantageous rates are offered them, can reduce their operations over the peak-load hours. Industrial electric heating has passed out of the experimental stage and carries large potentialities, especially for off-peak, automatically controlled operation. Battery charging for electric vehicles makes a desirable load, and transportation engineering presents many interesting problems to the central-station sales department. To bring about the location of new industries within the territory served should be part of the commercial operations of every electric utility.

Better illumination of the home, store, office and factory holds out the possibility of at least doubling the sale of energy used for lighting purposes. Systematic selling of electric signs based on actual measurement of their advertising value in people reached has yet to be fully capitalized. Street and highway illumination can be sold on its merits as an asset to a community in safety and increased property values. The artistic advantages of light in the home will eventually sell many more kilowatt-hours to domestic patrons than they need for strictly utilitarian purposes.

Electrification of the home remains, indeed, almost in the experimental stage. Estimates are that only 4 per cent of residences are fully applianced. It is practicable for people of moderate means to use more electrical conveniences, such as electric ranges, refrigerators, washing machines and even electric water heaters in addition to innumerable smaller devices, and a desire to do this is seen on every hand. A connected appliance load of 15 kw. in the home is easily possible.

Many central-station companies have already taken steps to seize this opportunity by expanding their sales departments and adopting continuous selling programs. The benefits of such a policy are manifold. The addition of a more diversified load will help the steady improvement of system load factors, and increasing the density of sales will result in more efficient use of investment, particularly that in distribution lines. More customers and larger sales to the individual small customer will reduce the likelihood of a decrease in earnings from business depression. Greater utilization of electric service by the public will tend to lower the cost of producing electrical energy, and this, coupled with longer hours' use of the capital investment, will make rate reductions possible. Increased sales will result in increased earnings and also in better customer and public relations, because it is but natural that the more of a given commodity or service an individual buys from a single company the better will be the understanding between the buyer and seller and the greater the possibilities of further sales.

Portable Lamps Important Consumers of Electrical Energy

THE attention which the portable lamp has received is not commensurate with its present and prospective importance as a consumer of electrical energy in residences and elsewhere. It possesses the great advantage of not only being useful when lighted but, besides, being effective all the time as a decorative element in the furnishing of a room. Unlike a toaster, a vacuum cleaner and many other appliances, the portable lamp is "earning its keep" in another rôle even when not actually in use. This accounts for its growing popularity with the householder, notwithstanding the fact that the central-station company in general has not focused attention upon it. The possibilities of portable lamps are astonishingly large. From the viewpoint of convenience and usefulness the average home should have five times as many as it now has. Add to this the purely decorative uses of the lamp, and sales far greater than any yet achieved are foreshadowed.

The decorative value of pictures, vases, draperies and other things not strictly utilitarian must be covered by interest and depreciation charges. What practical difference does it make if a decorative portable lamp has a maintenance charge as well? The important point is the total annual cost of this decorative value. In this respect portable lamps will hold their own with purely decorative furnishings besides serving in addition to provide useful artificial light. In the middle-class urban homes of this country there is an average of less than two portable lamps—less than one for each living room. There is an average of one for seven bedrooms. Homes in towns and villages are, of course, not so well equipped as city homes. From a purely utilitarian viewpoint each bedroom should have one "portable" and each living room two or three.

The average sale of portable lamps must increase the central-station company's net annual profit per consumer very appreciably. Assuming that each lamp increases the daily consumption by 50 watt-hours, the additional net profit to the company should be about one dollar a year per consumer. Casual observation reveals the fact that portable lamps are lighted when not directly in use much more than lamps in fixtures are. This applies not only to the living room, but to other rooms, including bedrooms. One of the most interest-

ing points in the matter is the different attitude taken by the householder toward "portables" as compared with fixtures. In the sale of portable lamps department stores, furniture stores and other dealers are doing much and at the same time are steadily increasing the revenue and profit of the central-station company. Is the part of the lamp in revenue building adequately appreciated and fully capitalized by the latter?

Two More Cities to Push Trucks

THE central-station companies in Cincinnati and Cleveland have decided to take up the development of a battery-charging load through the promotion of electric trucks for use by local industries. In both cities a special transportation engineer has been employed to do the selling. Slow progress is often safest when new principles and policies are involved. Perhaps it is just as well, then, that the electric truck goes forward with a gradual increase rather than with any spectacular burst of speed. For one of the great obstacles to the acceptance of the electric truck by central-station men has been an early record of disappointments that followed an overenthusiastic adoption of these trucks in central-station service by men not trained in their application or operation and with schemes that were far from a state of practical perfection. So, in spite of the apparent delay in forwarding the development of electric highway transportation, perhaps the industry has merely reduced momentum in order to build more securely.

Last year a series of truck schools were held in different parts of the country. Many central-station men took the course, and the work is apparently bearing fruit. San Francisco established a truck promotion bureau last spring. Now the two Ohio cities take hold. It is a good sign.

Distribution Costs Most and Earns Least

AN ANALYSIS of budget expenditures by light and power companies shows a marked increase in the money appropriated for the distribution system. The past two years witnessed a very large building program in generation and transmission, and it is natural now to turn to the distribution system and increase its capacity to correspond. Another factor is the necessity to remodel and rebuild old distribution systems which grew in a hit-or-miss fashion and now prove uneconomical and inadequate.

Yet the distribution system is the part of the system which present prices of material and labor affect most seriously, and it is of great importance to invest the expenditures efficiently. In generating stations larger units serve to reduce costs per unit of capacity, and in transmission high voltages permit investments to be reduced per unit of capacity; but there are few developments in distribution practices to offset the increased price levels of the present day. Scattered loads, small transformers and low load factors, low voltages and higher service standards work to make distribution unit costs very large. Lines must be built far in advance of capacity loading, and returns on the full investment are delayed for a longer period than occurs in other system investments. And with the increased demand for electric service in suburban and rural communities the loads per unit length of new distribution lines decrease, for there no longer exist many unserved homes or factories in congested districts.

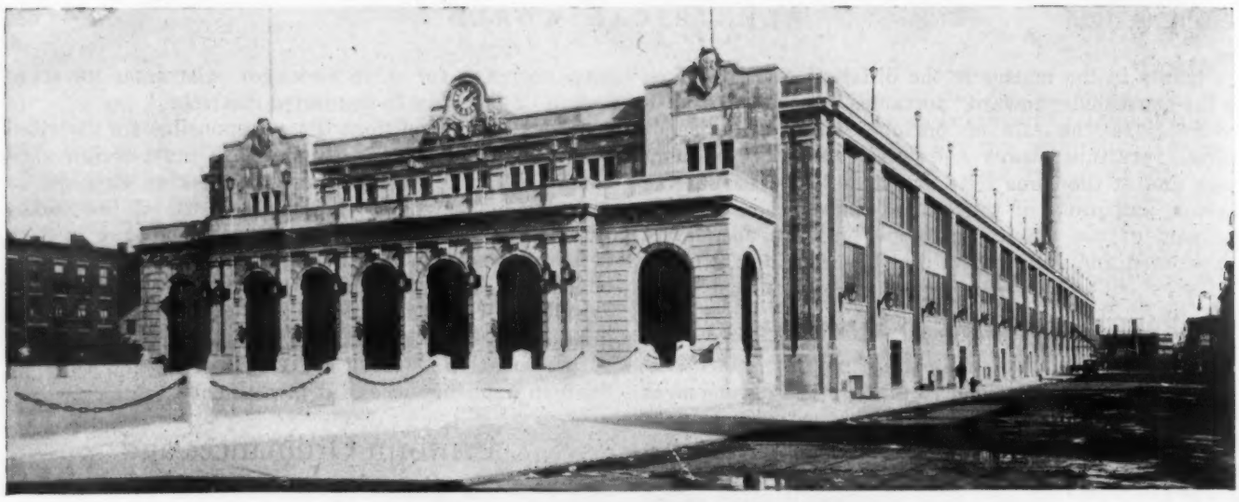
Under these conditions those responsible for distribution system changes and extensions must weigh very carefully all the economic and engineering elements in order to insure the most economical use of the money invested. Moreover, if the new extensions are to earn returns as soon as possible, the power sales and merchandising departments of the utilities must follow closely the construction crews to get all possible business on the lines immediately and to increase the saturation in existing services. Engineering and sales go hand in hand in successful investments.

Uniform Ordinances and Standards Needed

ONE of the wasteful and vexatious situations in the electrical industry results from a lack of uniformity in municipal ordinances covering wiring inspections and from a similar lack of uniformity in the interpretation of the National Electrical Code. The utility companies, the insurance inspectors, electrical manufacturers and jobbers and municipal inspectors pretty generally agree that present conditions make for lost motion, waste and uneconomical development. In many states a condition is found where no two similar communities have the same requirements in inspection or interpretation. Utilities are a law unto themselves in their service requirement. Inspectors interpret the code differently and act according to particular municipal ordinances. These conditions prevent manufacturers, contractors and utilities building business under known and uniform conditions. A national uniformity in code, inspection and service requirements is badly needed.

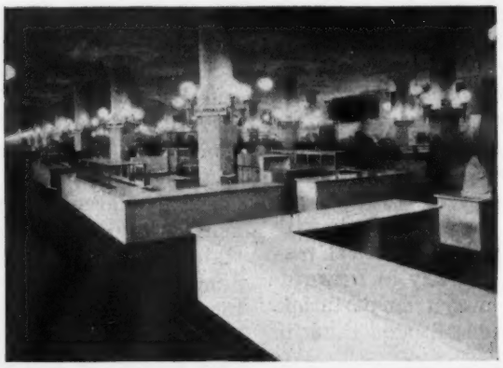
Three essential steps seem necessary to improve conditions: (1) A uniform ordinance produced and agreed upon by national associations; (2) an amplification, clarification and classification of the National Electrical Code so that it will cover all situations and will be interpreted uniformly; (3) a national plan for revisions of the regulations as the industry changes and for carrying out the educational and co-ordinating work necessary to the institution and operation of the ordinance and the code. Police and enforcement power is a part of the duties of a municipality, and local inspectors will usually be responsible for enforcement. State and national legislation or agreements will therefore not be efficacious unless followed through by local action in each town or district. The electrical industry and the insurance industry are most vitally concerned in bringing about improvement and therefore should undertake active joint work in the production of the ordinance and to insure uniform interpretations of the National Electrical Code.

A further step would seem to be necessary—the institution of state committees and local committees in each town or district so that complete touch can be maintained at all times on a national and local scale. Much work will be required to obtain the uniform ordinance, the improvements in the code, the adoption of the ordinance by each community, the co-operation of all local interests and the revisions made necessary by changing conditions. It is indeed encouraging to note that local code committees have been organized in many communities and have done good work. National committees, too, are now actively at work.



Effective Lighting for Newark Public Market

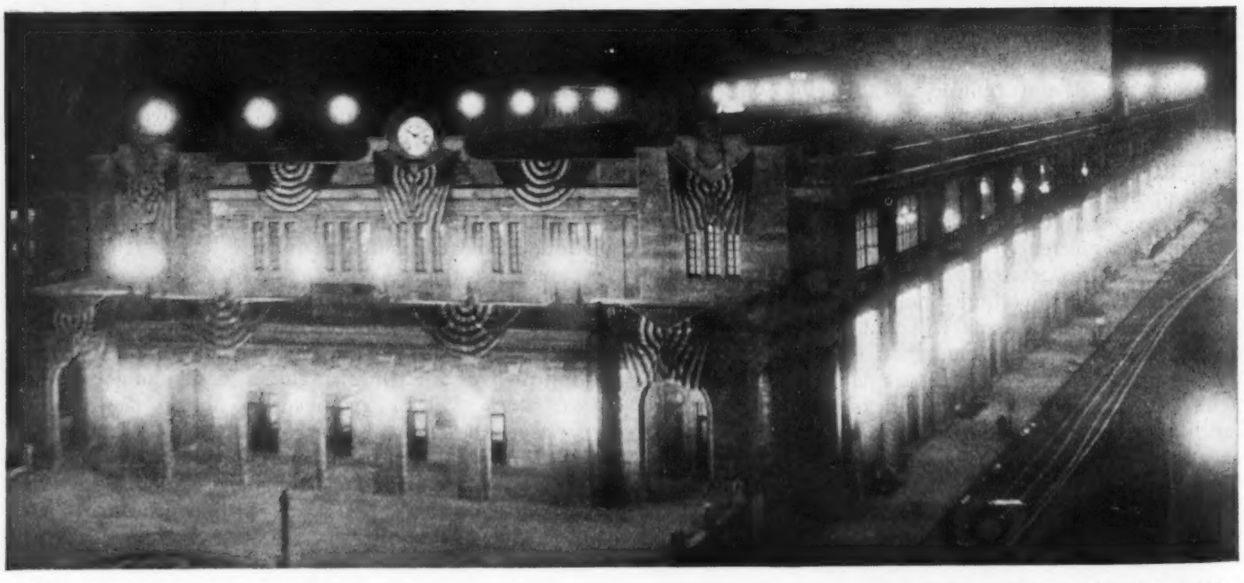
ONE of the most interesting features of the new Public Market at Newark, N. J., covering four acres, is its method of illumination. On the exterior ornamental lanterns are suspended from heavy brackets for lighting the walks and similar lanterns on newels outline the edges of the roof and the front balcony.



Two types of 300-watt luminaires are used for interior lighting, a suspension unit of the inclosing globe type above each aisle and a set of four ornamental cast-iron brackets attached to the column in the center of each stall. A recent survey showed that this system gives an intensity of between 11 ft.-candles and 12 ft.-candles at the aisle intersections, 9.8 ft.-candles on the counters and between 2.7 and 4.2 ft.-candles on the floor under booth shelves.

Exterior View of the Public Market Building at Night, Showing the Completeness of the Exterior Lighting Installation

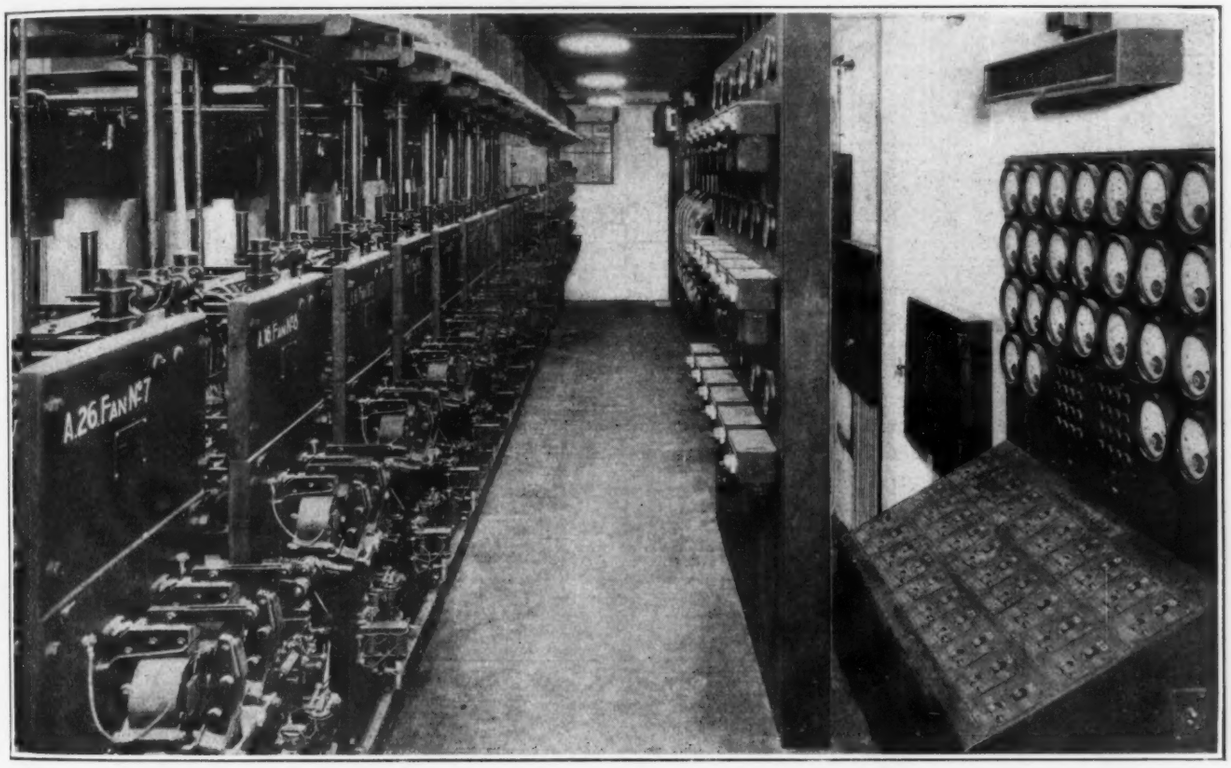
Interior Illumination of the Market The Open Farmers' Market at Night, Showing the Illumination of the Loading Platforms



Automatically Controlled Asbestos Mill

How This System Has Been Applied in Crushing, Screening and Grading Asbestos—Mill Operated from One Control Room, Where Instruments and Switches Have Been Concentrated—Details of the Installation

By A. A. ST. AUBIN
Manager Canadian Comstock, Ltd., Montreal, Canada



ALL MOTORS ARE CONTROLLED FROM THIS CONTROL ROOM

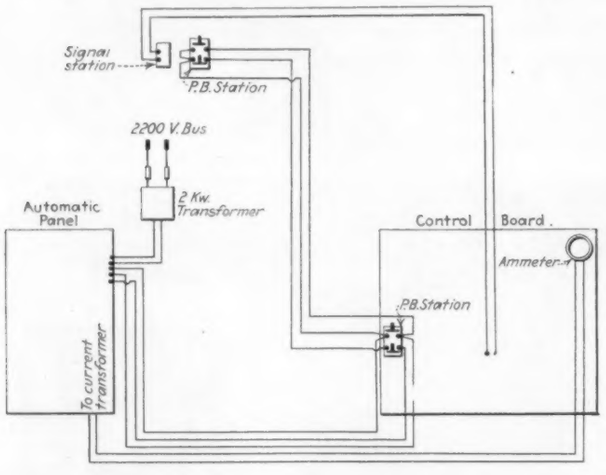
THE Asbestos Corporation of Canada, which is the largest producer of asbestos in the world, has recently installed for its secondary crushing, pulverizing and screening operations a full automatic-control system for all motors rated at more than 5 hp., with instruments, contactors and switches being centrally located in one operating room. Stop-and-start push-button stations as well as operating-room signal buttons have also been installed at each motor.

A brief description of the company's manufacturing process will give some idea of this installation. The asbestos ore is brought into the building sized to about 2 in. It is automatically weighed by electrical equipment as it passes along on the conveyor belts. It then goes through a magnetic separator for the purpose of removing nails, pick heads or other foreign magnetic matter which may have found its way into the ore. After being dumped in a hopper it is fed to the first stage of what is called secondary crushing. From this crusher it falls into a bucket conveyor, which in turn dumps it onto screens. While passing over the screens it is shaken, the loose sand being removed and carried away on belts and the fiber sucked up into hoppers. From these screens the ore goes to a crusher of a different style, a vertical tank-like machine. This process of crushing and screening is repeated four times, after which the fiber is graded by means of rotary screens. The various grades are then bagged by a special machine and the finished product is taken by elevators and conveyors to storage sheds.

In designing the electrical equipment the first essential was that it be dust-proof. Otherwise the fine white dust would silt through the most minute openings in an almost inconceivable way, and in time would affect the satisfactory operation of the equipment. Another objection to be avoided was the elapse of too long a time after the motors began operation before the mill was ready to start up. With these two points in view the writer designed a central-control system for all the motors in the mill. Automatic starting equipment was installed for all motors of 5 hp. and over. For a few of the smaller motors of about 1 hp. capacity manual control was installed. The starting equipment for these motors, however, is in the control room.

Thirty minutes before starting one man makes the rounds of all motors and equipment. If a machine is

ready to start, he pushes the signal button which lights a lamp on the benchboard. This lamp has a number on it corresponding to the particular motor. As he goes from motor to motor he presses these signal buttons. Then, at five minutes to the hour, the operator begins to start



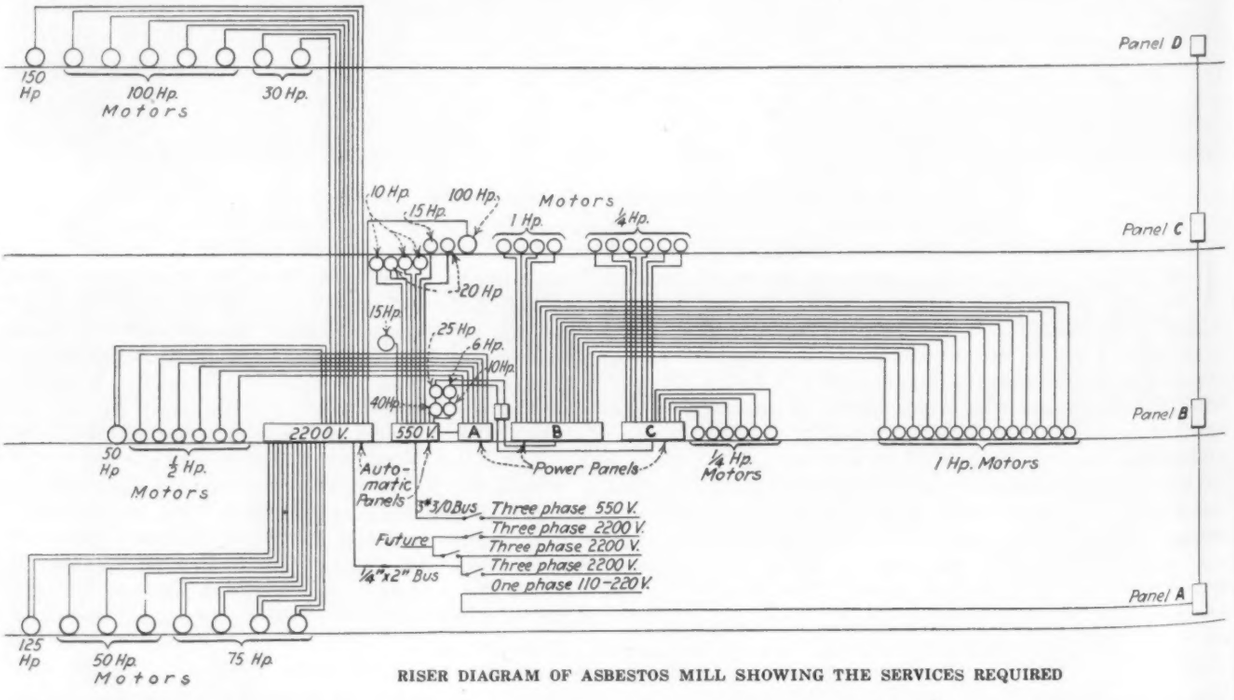
COMPLETE AUTOMATIC CONTROL AND SIGNAL INSTALLATIONS EXPEDITE AND MAKE RELIABLE MILL OPERATIONS

the mill. Should any irregular condition exist in starting, the operator immediately notices it on the ammeter. Moreover, the men, who by this time are on the various floors, have absolute control over the stopping of any motor should something go wrong. Along with the signal button there is a stop button close to each motor. This button can be padlocked in the "stop" position in case of trouble and also if it should be necessary for a workman to make repairs.

The benchboard referred to is shown in the right foreground of the control room. It is made entirely of No. 10 gage steel reinforced by angle iron. There are at present twenty-six push-button stations in use, also twenty-six ammeters, space being allowed for four spare units. The lamp annunciator shown in the center of the board is operated by relays mounted in the case above. These relays and lamps are operated at 14 volts from a transformer of small capacity. The "reset" for these lamps is electrically operated. As is evident by the appearance of some of the control equipment, a number of motors are arranged to start in two steps; that is, one accelerating and the other placing the motor on the line. Other motors, used on crushing equipment, are arranged for four, five and six steps. Current must drop to a predetermined value on the first step before the motor is placed on the second point, and so on. Of course, this is done automatically. All the operator has to do is merely to push the starting button. During this process he is able to see the actual load by reading the ammeter in front of him, which is numbered to correspond with the motor.

COST RECORDS OBTAINED

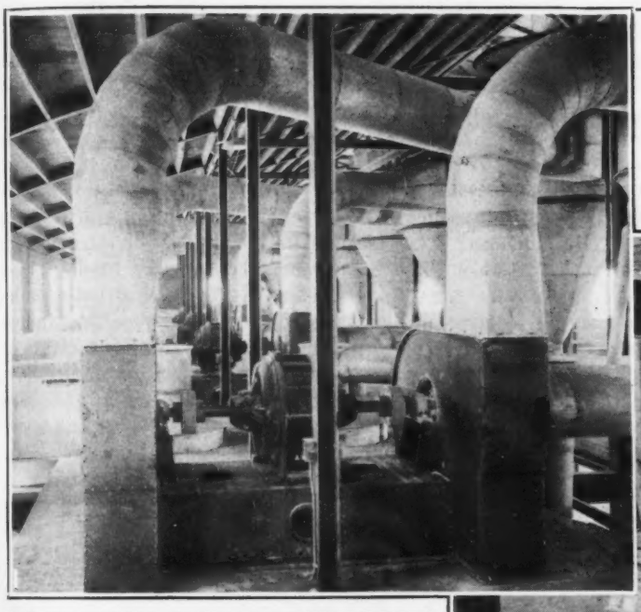
In order to have available accurate information as to the costs of the various processes in the mill, the control equipment has been grouped so that the energy taken by different loads can be easily integrated, the division including crushing, screening, grading, suction and conveying. These integrating wattmeters, six in number, may be seen on the left-hand side of the control room, half way down and just underneath disconnecting switches. The switches are used to remove from the main bus any of the automatically starting equipment for inspection or adjustment. Two metal raceways run the entire length on each side of the control room. One of these raceways carries control wiring, the other metering circuits. The wiring in these is brought into the benchboard and racked on suitable terminal strips. Many of the motors, particularly those driving crushing apparatus, are of the slip-ring type. A special housing was built to inclose these slip rings in order to keep dust from entering. Asbestos dust being non-explosive, it was not necessary to make an elaborate explosion-

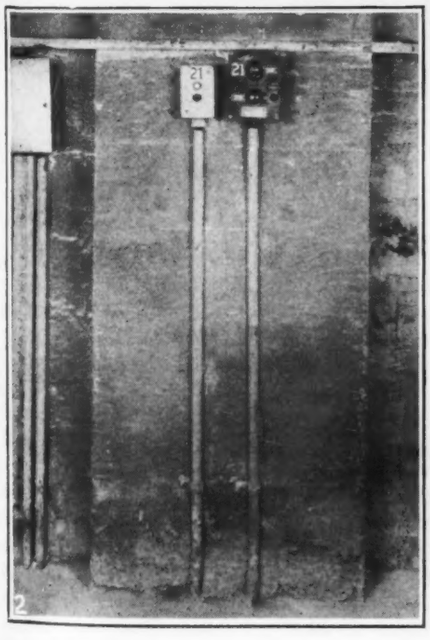


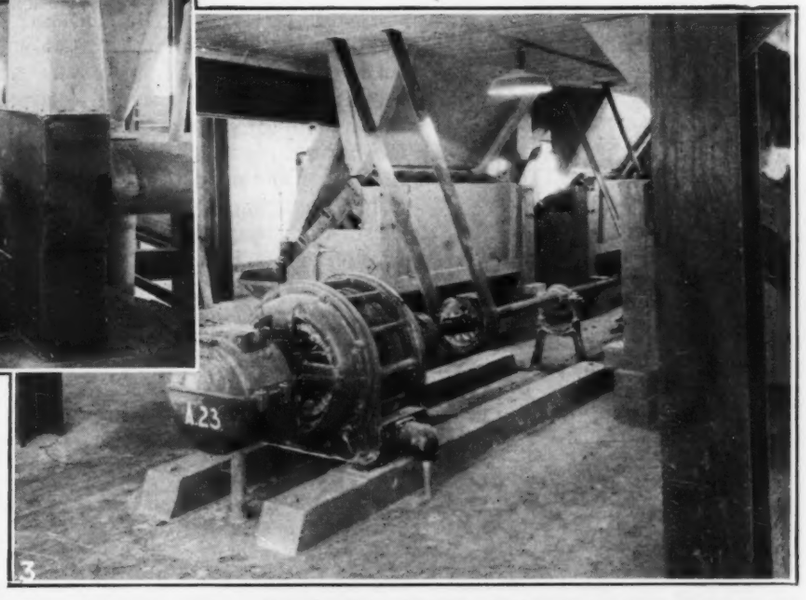
RISER DIAGRAM OF ASBESTOS MILL SHOWING THE SERVICES REQUIRED

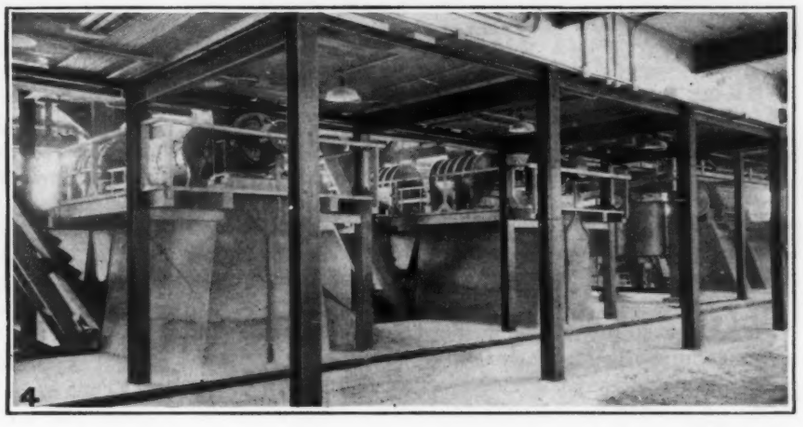
proof inclosure. All motors of 30 hp. and over were designed for operation on 2,200 volts. The approximate connected load of the mill is 1,500 hp. A thoroughly safe installation could only be assured by the use of conduit boxes, which were therefore installed on all motors. A small substation was built alongside the mill for the purpose of supplying 550-volt power and 110/220-volt lighting current.

Provision was made during the installation of the sets, one to generate 220 volts, three-phase, 60-cycle current and the other for 115-volt, single-phase, 15-cycle current. A rectifier is arranged for 125-volt direct current for magnetic separator and automatic scales, these various voltages and frequencies being required in order to accommodate the wide range in speeds as well as for other reasons. It will thus be noted that in this mill there is in use current of the following descriptions: three-phase, 30-cycle, 550-volt; three-phase, 30-









MOTOR DRIVES FOR INTERIOR INSTALLATIONS THOUGHTFULLY INSTALLED

No. 1. A part of the suction apparatus in the mill.
No. 2. Typical slip-ring inclosure and terminal box.
No. 3. Crushing floor and bucket elevators.
No. 4. Typical motor control and signal station.

first unit for a future unit. That is, an additional feeder circuit was run from the nearby substation of the Asbestos Corporation to the control room for 2,200-volt service. The transformers supplying 550-volt service as well as the feeders were made large enough for two units. The lighting transformers, supplying 110/220-volt, three-wire service as well as dead-front panels, circuiting and reflectors, were also installed complete for two units. The control room has a mezzanine floor on which are now installed two motor-generator

cycle, 2,200-volt; three-phase, 60-cycle, 220-volt; single-phase, 15-cycle, 115-volt and 125-volt direct current.

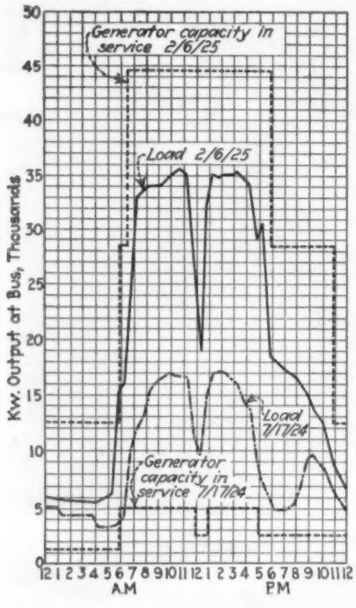
This installation has, after more than a year's operation, proved most successful. Not only has it met every expectation of its designer, but it has been termed an unqualified success by the owners. The entire electrical equipment was supplied by the Canadian General Electric Company, and the entire electrical plant was designed and installed by the Canadian Comstock Company of Montreal.

Keeping Dollars at Work

Possibilities of Increasing Diversity and Raising Load Factors—Present Conditions Are Surveyed—Automatic Equipment Helps Industry—Pioneering Business Opportunities — Small Customer Business Should Be Developed

THE light and power industry has a capitalization of more than $6,500,000,000 and an income of $1,500,000,000 a year, according to 1925 statistics. Both the enormous investment and the low turnover indicate the necessity of using every legitimate endeavor to make the most of existing investments and increase the revenues.

Roughly, the equipment and plant of the industry is used one-third of the time, and at least 10 per cent of the investment is in the form of insurance reserve having no earning power and about 20 per cent of the energy generated earns no revenue. These conditions and the rising costs of fuel, labor and materials make it imperative to study possibilities for economies.



WELL DIVERSIFIED INDUSTRIAL AND RESIDENTIAL LOAD

Two daily load curves of a central station with widely diversified load but buying part of its energy and having a 38 per cent annual load factor.

Greater diversity in loads, higher load factors and greater density in loads are the three fundamental means to secure improvements. Interconnections between the different generating stations and utility systems are going on constantly to reduce the proportion of capacity needed for insurance reserve and to utilize existing diversity in loads, but these moves, while worth while, will not completely meet the needs. The distribution system is the investment that costs most, is used least and suffers from the lowest load and diversity factors. Most of the heavily congested district motor and lighting load is already served by existing distribution systems, and extensions are being made into lightly loaded and suburban areas where costs increase per unit length of line and load density decreases.

LOAD FACTORS IMPROVE SLOWLY

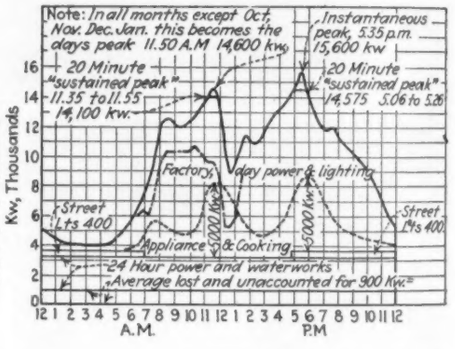
The load factors of a number of large systems have remained almost stationary for some time, and while new loads have been obtained they have tended only to increase the peak demand and kilowatt-hour sales without improving the daily or yearly load curve. Most of the available loads offer little hope of improvement in this respect as their general load characteristics are the same as those already connected to the central-station companies' lines.

Typical daily load curves of a number of representative companies in the East and Middle West as reproduced show much the same general characteristic; that is, a high morning peak between the hours of 8 a.m. and 11 a.m., and a high afternoon peak between 2 p.m. and 5 or 5:30 p.m. From 6 p.m. there is a steep decline until about 11:30 p.m., and from that time to 1 a.m. there is a still sharper drop, so that, varying with different companies, in the seven or eight hours between 11 p.m. and 6 to 7 a.m. the total load on the system may be only 15 to 20 per cent of the day load. These figures are for typical steam plants having little or no hydro-electric power, serving widely diversified industries and having a comparatively small amount of twenty-four-hour business other than water pumping.

The accompanying tabulation shows the annual load factor of a number of the largest systems for the years 1915, 1919 and 1923. There has not been any great change in the load factor of these systems over the last eight years, even during the war stimulus, when every effort was made to secure continuous and maximum production. Excluding the strictly hydro-electric companies whose yearly load factor may be affected by unusual water conditions in a single year, it will be seen that as a general rule companies serving industrial loads have shown a small improvement in system load factor.

EFFECT OF HIGH DIVERSITY

Load curve of system which has connected virtually all available power loads and also developed electric range, water heater and appliance business to a high degree.


Note: In all months except Oct. Nov. Dec. Jan. this becomes the days peak 11.50 A.M. 14,600 kw.
Instantaneous peak, 5.35 p.m. 15,600 kw
20 Minute "sustained peak" 11.35 to 11.55 14,100 kw.
20 Minute "sustained peak" 14,575 5.06 to 5.26
Factory day power & lighting
Street Lts 400
Appliance & Cooking
5000 Kw.
Street Lts 400
24 Hour power and waterworks
Average lost and unaccounted for 900 Kw.
Kw. Thousands
A.M.
P.M.

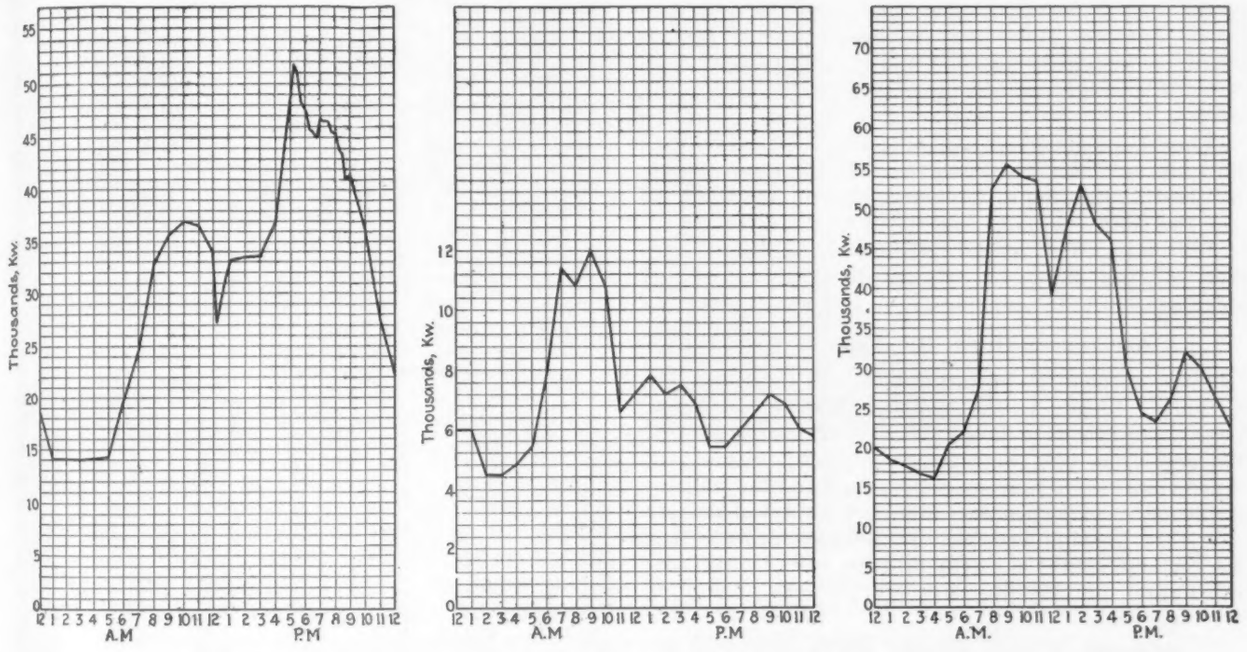
The Commonwealth Edison Company increased its load factor from 42.5 per cent in 1915 to 47 per cent in 1923, the New York Edison and United Electric Light & Power combined system increased from 35.3 per cent in 1915 to 40.1 per cent in 1923, Detroit Edison from 44.1 per cent to 51.2 per cent, Duquesne Light from 38 per cent to 55.5 per cent, Edison Electric Illuminating Company of Boston from 32.7 per cent to 39.2 per cent, the Brooklyn Edison Company from 35.4 per cent in 1919 to 37.9 per cent in 1923, while only five companies in the list showed a decrease, and all of these were more than 50 per cent hydro-electric companies.

But the fundamental conditions in different sections of the country govern the possibility of load-factor improvement. The following conditions exist as regards load factor of different industrial loads:

	Per Cent
Diversified industrial load	40 to 50
Iron, steel, glass and electro-chemical	60 to 70
Metropolitan business and residential	30 to 40
Agricultural, commercial and residential	20 to 30

The present trend toward interconnection will have little, if any, effect upon load factor, but will improve capacity factor; that is, the ratio of average load to the installed generating capacity. Interconnection will reduce the reserve capacity required in generating stations and improve operation by utilizing diversity between the time loads appear on the systems. But unless all types of loads are available in one territory, interconnection will not improve load factor.

The question of increased cost of central-station systems per kilowatt of capacity is reflected in the tabulation below.



DAILY LOAD CURVES FROM THREE COMPANIES SERVING DIFFERENT KINDS OF COMMUNITIES

At left—Principally lighting and commercial load with a few large industrial users. In center—Specialized industrial load with very little residential or commercial business. At right—Diversified industrial load. All three indicate the need for valley loads.

POSSIBLE IMPROVEMENTS OUTLINED

Possibilities of securing additional business which will help to improve load and diversity factors lie along two general lines—first, intensive development of existing loads looking to longer hours' use and more intensive application of service by the individual customer, and, second, developing new applications.

So far as actual motorization of industrial operations is concerned this load is to a very great extent already served by the central-station industry. But the questions of load factor and greater use of investment are just as vital to an industrial plant as to the central-station company. Costs of machinery and wages have increased so that if production can be raised without increasing investment a distinct saving will be effected by the manufacturer. Here is an opportunity for the central-station's power sales department to help its industrial customers in devising ways and means of operating their plants over longer periods of the day so as to get a larger number of actual working hours out of their machine tool equipment. Application of automatic control to reduce or eliminate human attendance at night offers considerable opportunity here. A concrete illustration of the principle is shown in a New England brass mill which formerly was operating with a load of 7,000 kw. for nine hours of the day and 1,000 kw. for the remainder. By rearrangement of factory routine and installation of automatic equipment the day load of this factory was reduced to 4,000 kw. and the night load increased to 3,000 kw., which effected a considerable saving, not only in labor and fixed charges but in the power bill as well through reduction of demand charge and advantages of the off-peak rate and longer hours' use.

So far only the surface possibilities of industrial electric heating have been touched, although upward of 1,000,000 kw. in heating apparatus is installed and earning annual revenue at the rate of $40 per kilowatt connected. This equipment lends itself particularly well to off-peak operation. Frequently it can be installed in an industrial plant so as not to increase the maximum demand, but by operation at times the motor load is idle it will earn a very low rate per kilowatt-hour and improve load-factor conditions.

Heavy-duty electric cooking, bake ovens particularly, represents a most desirable off-peak

CENTRAL-STATION GENERATING CAPACITY, CAPITALIZATION AND GROSS REVENUE

	Generator Rating, Kva.				Capital per Kva. Gen. Cap.		Ratio Capital to Annual Income
	Hydro	Steam	Total	Capitalization		Total Revenue	
1915	3,300,800	5,512,200	8,813,000	$2,900,000,000	$329	$398,000,000	7.3/1
1920	5,406,500	9,510,400	14,916,900	4,100,000,000	275	882,750,000	5/1
1925	8,093,000	17,728,000	25,821,000	6,600,000,000	256	1,450,000,000	4.5/1

load requiring little if any additional capital investment and returning a very attractive revenue per kilowatt of demand.

DEVELOP LIGHTING BUSINESS

Lighting as a load and revenue producer is just beginning to "come into its own" after several years of a position of secondary importance. What this can be made to mean in additional central-station revenue is shown in the results of many kitchen-lighting campaigns where the installation of but one lighting unit has added something like $8 to the customer's annual use of service. If the lighting of each room of say a five-room dwelling could be improved in a like manner by the sale of portable lamps, decorative fixtures and special lighting effects the customer's use of service would be increased $40 per year, considerably more than the average residential customer's present use of service.

Industrial, commercial, sign, street and highway lighting have not been developed to a much greater extent than has the lighting of the home. In one company last year the additional sign load taken as the direct result of light sales effort brought $35,000 in additional revenue and the increased commercial lighting business added $45,000 to the earnings.

APPLIANCES OFFER BIG POSSIBILITIES

In the residential business, however, there are opportunities to add to the appliance load very greatly. Recent surveys of a large number of homes showed that only 4 per cent were fully applianced, 16 per cent owned from two to four appliances each and the remaining 80 per cent owned less than two electrical devices other than lighting fixtures. Therefore it appears that this remains almost a virgin field for sales by the central station and the diversity of this type of load is extremely high.

Of particular interest are the larger household devices, the electric range, the refrigerator and the electric water heater, all of which are still in the pioneering stage of introduction. It will without doubt be possible to equip many homes of people with moderate means with all of these devices, which will mean that such a residential customer will have a total load in household appliances of between 10 and 15 kw. in addition to lighting and whose annual bill for electric service would be in the neighborhood of $150.

Cultivation of the small customer, for whom the greatest investment in distribution equipment has been made, offers the greatest possibilities of additional business without making additional investment in plant or system capacity. A tabulation of the sale of energy to customers of all classes in New York State shows that approximately 15 per cent of the kilowatt-hours sold to residential and commercial customers accounted for more than 50 per cent of the central-station companies' total revenue.

Methods of load and business development vary of course with the kind of territory served and the availability of loads, but load diversity offers the best means of greater utilization of investment and a consistent improvement in system load factor. One of the best concrete examples of commercial practice which has resulted in continuous growth in earning and a highly desirable diversity of load is shown in the record of the Worcester (Mass.) Electric Light Company, where, despite the fact that during the industrial setback in New England power sales dropped off 25 or 30 per cent, the company recently declared its regular dividend at the rate of $12 annually and an extra one of $10 a share.

To secure greater saturation, better load factors and greater diversity it is necessary for each utility to study local conditions carefully and to be alert to every opportunity to sell or to pioneer all possible load-building business. New industries are being developed continually and old industries are subject to great changes, and the utility has an opportunity and a responsibility in guiding developments to secure the greatest possible economy in investment and operation.

TABLE I—LOAD FACTOR OF LARGE SYSTEMS

Company	1915	1919	1923
Niagara Falls Power Co.	81.3	84.2	83.0
Commonwealth Edison Co.	42.5	44.6	47.0
New York Edison and United Electric Light & Power Co	35.3	38.5	40.1
Pacific Gas & Electric Co.	59.4	60.7	65.0
Southern California Edison Co.	57.8	58.3	56.5
Detroit Edison Co.	44.1	47.4	51.2
Philadelphia Electric Co.	....	41.4	45.3
Montana Power Co.	84.1	74.0	81.7
Public Service Electric Co.	37.7	45.1	44.1
Duquesne Light Co.	48.0	45.0	55.5
Southern Power Co.	....	34.2	42.3
Cleveland Electric Illuminating Co.	....	43.0	49.6
Alabama Power Co.	48.0	47.7	48.8
Buffalo General Electric Co.	....	54.5	52.2
Consolidated Gas, Elec. Lt. & Pwr. Co. of Baltimore	55.0	54.9	55.8
Union Electric Light & Power Co.	42.6	....	49.1
Mississippi River Power Co.	....	59.4	57.6
Utah Power & Light Co.	....	65.9	67.1
Brooklyn Edison Co.	....	35.4	37.9
Great Western Power Co.	62.0	60.9	59.5
Puget Sound Power & Light Co.	51.2	55.0	53.1
New England Power Co.	40.0	43.5	47.0
Consumers Power Co.	52.5	47.8	46.9
Edison Electric Illuminating Co. of Boston	32.7	36.4	39.2
Pennsylvania Water & Power Co.	51.9	67.2	56.8
Washington Water Power Co.	66.0	43.6	55.4
Adirondack Power & Light Co.	....	41.8	52.4
Narragansett Electric Lighting Co.	....	31.2	48.5
Portland Railway, Light & Power Co.	....	55.0	51.0
Georgia Railway & Power Co.	45.1	41.8	47.8
Potomac Electric Power Co.	35.0	42.3	45.1
Virginia Railway & Power Co.	....	42.3	46.5
Michigan Northern Power Co.	....	84.3	86.4
Southern Sierras Power & Nevada-California Power Co.	64.2	64.7	62.3

TABLE II—DIVISION OF TOTAL SALES IN NEW YORK STATE*

	Domestic and Commercial Service					
Year	Per Cent Kw.-Hr. Sales	Per Cent of Revenue	Revenue per Capita of Population Served	Manufacturing Including Meters per 100 Population	Street Per Cent Kw.-Hr. Sales	Power (Not Railways) Per Cent of Revenue
1910	6.7	42.1	$1.76	3.40	70.0	33.1
1911	7.1	42.3	1.92	4.31	70.8	34.4
1912	6.7	42.9	2.18	5.08	71.4	34.6
1913	6.6	41.9	2.23	5.52	72.3	35.2
1914	7.9	41.8	2.38	6.23	68.8	35.8
1915	8.2	43.4	2.57	7.30	68.9	34.9
1916	8.0	43.4	2.87	8.20	70.6	37.3
1917	7.7	41.8	3.19	9.04	75.1	40.1
1918	7.0	38.5	3.31	9.71	81.0	46.0
1919	10.4	41.8	3.92	10.55	73.2	43.6
1920	10.2	43.7	4.48	12.09	75.5	42.6
1921	13.3	47.9	5.11	13.72	71.2	38.6
1922	12.7	45.6	5.94	14.90	74.1	39.0
1923	12.7	48.5	6.94	17.20	75.4	40.0
1924†	15.0	52.5	7.50	20.00	70.0	36.0

*Includes both generated and imported power. †1924 estimated.

TABLE III—GROSS REVENUE FROM SALE OF ENERGY IN UNITED STATES

	Amount	Increase Over Previous Year	Per Cent Increase
1915	$360,000,000	$23,020,000	6.8
1916	436,000,000	76,000,000	21.2
1917	521,000,000	85,000,000	19.5
1918	664,850,000	143,850,000	27.5
1919	773,650,000	108,800,000	16.3
1920	882,750,000	109,100,000	14.1
1921	944,400,000	61,650,000	7.1
1922	1,084,000,000	139,600,000	14.1
1923	1,269,550,000	185,550,000	17.1
1924	1,335,100,000	65,550,000	5.3

Note how industrial depression is reflected in years showing small rate of increase.

Modern Highway Lighting

Outrigger Supports Lamps Rigidly, Clears Foliage and Permits Easy Renewal—Illumination Proves Good Advertisement

BY A. L. SPRING
General Electric Company, Los Angeles, Cal.

EXPERIENCE in the lighting of highways has proved conclusively that it is imperative that the lighting units be rigidly supported in the proper position over the highway so that the light shall be directed exactly where it is needed and glare be eliminated. To accomplish this the units, wherever possible, should be installed at the side of the road at an elevation of from 30 ft. to 35 ft. above the roadway.

Highway lighting should give a fairly uniform intensity of light on the road surface. The rays of light should be confined as much as possible to the road surface and not spread out in all directions. The highway lighting unit must yield a high degree of illumination. It must apply the utmost efficiency in distributing this illumination by bending all upward and outward rays.

In some cases a short bracket or a cross-arm will support the unit properly as shown in Fig. 1. In most cases, however, such an installation is not satisfactory because the unit does not extend out far enough to clear any foliage there may be along the highway. For some time the problem has been to support the unit rigidly in the position where it will give best results and still permit easy renewal of lamps. A satisfactory solution of this problem is an outrigger that has recently been developed and which is now on the market. This outrigger has effectively accomplished the desired results. It not only rigidly supports the lighting unit in its proper position, but also permits the renewal of lamps with safety and ease. All highway units now used should have a support which holds them in a fixed directional position. This cannot be done by ordinary means of suspension, but is accomplished perfectly by the outrigger shown. A highway lighting installation with this type of support is shown in Fig. 3.

In this day of congested automobile traffic the lowering of units to the highway for cleaning and trimming is extremely hazardous. With this trolley-type hanger the lighting unit is easily and quickly brought in to the pole and after cleaning and trimming is readily returned to the outer end of the outrigger, where it again resumes its original fixed focal position. These outriggers are now in use in the highway lighting systems of Ontario, Riverside, Burbank and Altadena, Cal.

The city of Altadena was one of the first cities on the Pacific Coast to illuminate its highways with highway lighting units. Twenty-seven miles of its boulevards are lighted with "Novalux" highway units. The average distance between units in this installation is about 350 ft.; 2,500-lumen, 6.6-amp. series street lamps are used, operated on type R.O. street-lighting transformers. Altadena's famous thoroughfare, Santa Rosa Road, as it looks at night is shown in Fig. 2. This road is known as Christmas Tree Avenue, because for two weeks each Christmas season many of the beautiful large cedar trees lining both sides are decorated with colored electric lights. In this section of the Altadena highway lighting system it was impracticable to install the units on the sides of the road on account of the large trees.

FIG. 3—10-FT. MAST-ARM SUPPORTING A "NOVALUX" HIGHWAY LIGHTING UNIT OUT OVER THE ROADWAY TO CLEAR SHADE TREES

The town of Sierra Madre, nestling in the foothills off the Foothill Boulevard, the main highway, was desirous of directing as much traffic as possible through its business center. The aim was accomplished by the installation of highway units on the main roads leading from the highway to the city. This, however, proved to be only one of the advantages of the lighting system.

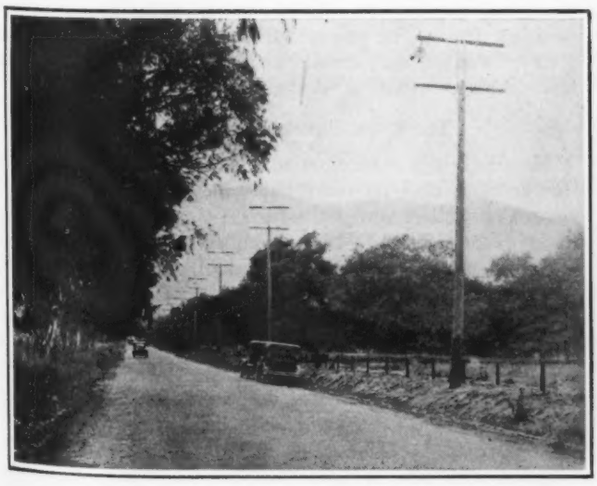


FIG. 1—HIGHWAY LIGHTING INSTALLATION AT SIERRA MADRE, CAL., WHERE CROSS-ARM BRACKETS HAVE PROVED SATISFACTORY BECAUSE OF LACK OF FOLIAGE

FIG. 2—CENTER-SPAN TYPE OF HIGHWAY LIGHTING INSTALLATION ON SANTA ROSA ROAD, KNOWN AS "CHRISTMAS TREE AVENUE," ALTADENA, CAL.

Before the roadways were lighted there were several hold-ups, which have ceased since the installation.

Highway lighting is consistently gaining ground, and the time is not far distant when many of our important highways will be well lighted. The following are some of the typical installations now in use in this country: Altadena, Cal., 267 units; Amherst, N. Y., 420 units; Detroit, Mich., 619 units; Tonawanda, N. Y., 265 units.

Highway lighting has been found to prevent accidents by illuminating dangerous curves, reducing headlight glare and allowing the sides of the road and obstacles in the way to be seen clearly. It adds to the comfort of night driving by relieving the eye strain, assisting in making repairs and decreasing the number of hold-ups. It increases night traffic and thereby relieves day congestion. It decreases running time and increases road capacity. It is vital to the development of outlying communities and should be advocated by the electrical industry at every opportunity.

Economic Aspects of Power-Factor Correction

Penalties as Optional Rates—Simplest Rates No Guarantee of Greatest Economy—Problems of Small Consumer—Defense of Present Metering Methods and Rate Schedules

By A. S. KNIGHT
Public Utility Consultant, Boston, Mass.

IN THE issue of the ELECTRICAL WORLD for January 17 Arthur Wright expresses his concern over the power-factor situation and makes some criticisms and suggestions in that connection. Mr. Wright is very naturally disturbed by the fact that low power factor results in wasted investment, useless copper losses and bad voltage regulation and that so little has been accomplished in overcoming these troubles. He believes that they all might have been avoided if the companies had started by charging on the kva. basis. This would, perhaps, have been the result if power-factor correction of induction motors up to 100 per cent were economically practicable. It is well known that this is not the case, however, on account of the rapidly increasing cost of corrective apparatus as power factors approach unity; so that if correction is made only up to say 80 or 90 per cent, light load conditions at customers' premises (in the case of small customers especially) would still cause power-factor troubles. Under the existing conditions, however, the question is not what might have been done, but what should be done at present.

In considering the economics of low-power-factor correction it should be remembered that if it is going to cost more to raise low power factors (whether corrected by the customers or by the company itself) than it costs the company to carry them, there is no economic advantage in forcing the customers to correct, and attempts to do this beyond the point where correction will cost more than the charge made for failure to correct will of course be futile. This has been recognized by such companies as have adopted the so-called standard power factors less than unity, the intention being that customers shall be induced, by one method or another, to raise their power factors to this standard. This involves the assumption that differences in cost caused by power factors between this standard and unity should be averaged over the entire business of the utility.

POWER-FACTOR PENALTIES

It is pretty generally understood that electric lighting rates should be designed so that they will produce the lowest net over-all cost to the consumers, and this principle should apply to power-factor charges as well as to charges for true power. Up to the point where power-factor correction is economically possible, therefore, correction can be forced by means of power-factor penalties in the rates; and the question whether these penalties exactly represent the excess costs incurred by the company does not seem to me particularly important, inasmuch as such penalties can be avoided by the customer by merely raising his power factor. They can be regarded as optional rates; but if penalties are applied above the point where correction can be reasonably expected it becomes more important that they should have a reasonable foundation, inasmuch as they then become income producers, and not merely optional charges, and, like other rates, must stand or fall upon their reasonableness.

The development of unity-power-factor motors raises the question as to whether standard power factors of less than unity should be discarded in order to encourage the introduction of these motors; but, if so, the principles outlined will still apply on account of the continued use of the present induction motors. Whether or not such a change would result in the use of unity-power-factor motors will, of course, depend upon whether the fixed charges on the additional investment costs of the motors will be more than offset by the savings due to the power factor differentials, which, as I have pointed out, should in this zone have some relation to the companies' costs.

DEFENDS PRESENT RATE FORMS

Mr. Wright's reference to the "multiplicity of wholly unworkable and incomprehensible tariffs" is a pretty severe criticism and one which I do not think is justified. If he refers to rate structures as a whole, I need only say that, while these often appear to be unnecessarily complicated, it is hardly open to question that, in spite of the difficulties in understanding all the conditions of the rates, such rates have resulted not only in selling more service (as shown by the enormous importance which central-station service has reached since the development of these rates) but in more economical service than can be secured under rates simpler in form. I agree with Mr. Wright that the marvelous expansion of the business is not a justification of the present power-factor policies, but I consider that it is a justifi-

cation for the grouping of customers into classes and the elaboration of the rate structures necessitated by the classifications.

Large Consumers and Small Ones

When we come to analyze the power-factor question we find two separate and distinct problems—one that of the large consumer and the other that of the small consumer.

If Mr. Wright's reference applies to the power-factor clauses, I think he overlooks the fact that all of the power-factor clauses introduced into the rates up to the present time are intended to affect the large consumer only. Clauses and methods which might in fact be "unworkable and incomprehensible" if applied to the small consumers may be entirely practicable when confined to the large consumer, to whom expert knowledge is always available, if not actually in his employ, and where the business is of sufficient size to warrant the necessary metering expense. In the case of the large consumers there is no excuse for a company which allows such customers to operate with abnormally low power factors, as there is no doubt that it is entirely practicable to oblige such customers to bring their power factors up to a reasonable standard.

The problem in the case of the small consumers, however, is more difficult, although it is not the desire to "invent more scientific self-fooling tariffs" which has prevented the introduction of power-factor penalties to these small consumers. The whole question is whether it is better to average the power-factor losses of small consumers over the business of the high and low power-factor consumers or to attempt to collect these losses from the customers causing them. It must be remembered that the companies are now collecting these losses if their total incomes are correct, so that it is principally a question whether the present distribution of the companies' costs between customers is unfair to the higher power-factor consumers.

In this connection it should be remembered that most of the companies have regulations which attempt to keep individual power factors within reasonable limits by prohibiting service to extremely low-power-factor consumers. It is true that this is not always possible, as in the case of spot welders, but here the problem can be easily solved by the adoption of special charges for such classes of business, as the problem in this business is primarily one of load factor. Taking the ordinary run of small induction-motor consumers, however, there are a number of important reasons why the companies hesitate to adopt a system of power-factor penalties for these consumers.

Raising Long-Standing Rates

In the case of a company where regulations restrict extremely low power factors of customers of all sizes, where effective power-factor clauses have been applied to the large consumers, where both direct-current and alternating-current power is sold to small consumers at the same prices, such a company naturally hesitates to attempt to raise the rates of the small induction-motor customers above what they have been charged for the thirty-odd years that this business has been developing. Theoretically, perhaps, alternating-current power consumers should be charged more and direct-current consumers less on account of power-factor differences. On the other hand, studies made of the comparative efficiencies of alternating-current and direct-current service indicate that power-factor losses in the alternating current are offset by the greater efficiency of this service over the direct current, so that whatever adjustment might be made on account of varying power factor should be made only between the high and low power-factor alternating-current customers, with the result that different prices would have to be made for alternating-current and direct-current power, a change which warrants careful consideration in cities where these two services have been sold at the same prices.

While it is admitted that too great accuracy is not necessary, the inability to segregate the losses caused by low power factors of individual small customers with anything like the accuracy with which the losses caused by large consumers can be ascertained is, without doubt, one of the objections to applying power-factor penalties to small consumers and adds to the difficulties in adopting a schedule which would be reasonable.

Another condition which exists in many large cities is that thousands of small induction-motor consumers who are charged on the regular retail power rates use so little energy that they get no advantage from the lower steps of the rate, with the result that they pay the maximum lighting rate. A company would have either to raise the rate for such consumers who have low power factors above the present maximum rate or to exclude them from the power-factor penalties.

I believe also that there are valid objections to the method suggested by Mr. Wright of charging the small consumers on the kilovolt-ampere-hour basis.

The abandonment of ampere-hour meters in favor of kilowatt-hour meters I believe to be based upon more than the accidental development of the latter. It was due to the conviction of the superiority of the latter over the former, partly on account of the automatic adjustment for voltage variations which the kilowatt-hour meter accomplishes (this feature becoming of greater importance with the growth of three-phase systems) and partly to overcome other inherent objections to a system of charging based solely on kilovolt-ampere-hours.

One of these objections relates to the difficulty in proving reasonable a system of charging combining two elements having such different effects upon company costs as do true power and reactive power. Assuming that present kilowatt-hour prices were reduced so that the kilovolt-ampere-hour prices would conform with the average system conditions, the adoption of a new unit, besides being actually unfair in many individual cases, would still be open to the suspicion of its being merely a scheme for collecting more money from the small consumers, because the amount of the charge due to low power factor would be hidden so that it could not be determined by the consumer from his bill. Other technical objections to the use of the kilovolt-ampere-hour are well recognized and need not be repeated here.

My conclusion is that power-factor charges against small customers are not prevented by the companies' desire to work out too exact a system of charging, but because of the inherent difficulties in the way of introducing any system of penalties against this class of customers. When executives are convinced that the economic losses—or the injustice of averaging the losses between consumers—are becoming serious enough to offset the fundamental objections to applying power-factor penalties to small consumers I am sure there will be no great difficulty in obtaining a method of meeting the situation.

St. Paul Island Station

New 25,000-Kva. Plant of St. Paul Gas Light Company Uses Powdered Fuel Dried by Flue Gases and 325 Lb. Pressure

POWDERED fuel, water-screened furnaces under 1,044-hp. boilers, 325-lb. pressure with 220 deg. superheat and remote-controlled auxiliaries are some of the outstanding features of the Island station of the St. Paul Gas Light Company, recently placed in operation. Other features include superheaters of the combined convection and radiant type and feed-water bleeding of the turbine at four points.

The plant is situated on an island on the east side of the Mississippi River which affords good facilities for receiving coal by either railway or water. The station is divided into five bays with the coal-handling equipment on the channel side of the building, then the boiler room, then the heat balance and pump bay, the turbine room and finally the electrical bay on the north end of the building. The station was completed within eighteen months despite unavoidable delays in delivery of equipment and materials. The excavation was completed, the piles were driven and the waterproofing was laid without the use of coffer dams. Although only one unit now is installed—rated at 25,000 kva.—ample space is provided for two additional units if these come to be desired. The plant is designed as a standby plant.

Coal is delivered on the private right-of-way from the main line of the St. Paul, Minneapolis & Omaha Railway, weighed in on a track scale and dumped into the track hopper below the receiving track. From here it is automatically loaded into a skip-hoist bucket 125 ft. long and elevated to the first hopper in the plant. The coal is then passed through a reciprocating feeder, magnetic separator and grizzly, and through a 30-in. x 30-in. double roll crusher onto the distributing conveyors, which deliver automatically to three 200-ton crushed-coal bins. The coal is then dried by means of the hot gases from the base of the stack being drawn through it. The temperature of these gases is maintained at 325 deg. F. by means of thermostatic dampers.

Each bin drier feeds a 6-ton pulverizing mill. From here the pulverized coal is passed to the two cyclone collectors by a low-pressure air system. From the collectors the coal is carried in 12-in. extra-heavy cast-iron screw conveyors to the boiler room and distributed by means of two 12-in. screw conveyors to each of the four 70-ton pulverized coal bunkers. Power required for drying, pulverizing and conveying in the pulverizing plant is 18.8 kw.-hr. per ton. This is further divided into 3.9 kw.-hr. for drying, 8.2 kw.-hr. for pulverizing and 6.7 kw.-hr. for conveying.

Only three 1,044-hp. boilers are now installed, although provision is made in the plant layout for a fourth. Boilers are provided with both radiant (129-sq.ft.) and convection (2,820-sq.ft.) superheaters and have a water screen made of fourteen 4-in. tubes which separates the combustion chamber from the ashpit. Coal is fed to each boiler by three-screw duplex-type feeders which are operated at variable speed. Two pressure blowers take air from above the suspension arches and deliver to the feeders at about 120 deg. F. Each feeder supplies two burners since there are six standard corrugated fantail burners for each boiler set vertically through the furnace roof. Only about 10 per cent of the necessary air enters the combustion chamber with the fuel. The remainder comes through butterfly valves at the burner and from air ducts in the boiler walls, where it also cools the furnace walls. The ash is finely divided and is removed by a steam-jet ash conveyor.

Since most of the auxiliaries are motor-driven, the heat-balance system consists of three closed-type heaters, a single-effect evaporator system and an evaporating condenser in a surge tank. Condensate from the turbine is passed successively through No. 1 and No. 2 heaters and then to the surge tanks. Steam from the turbine bleeder No. 1 at 3.97 lb. absolute and from bleeder No. 2 at 16.4 lb. absolute is supplied to these heaters, which raises the temperature of the condensate to 78 deg. to 220 deg. F. as it enters the surge tank. The boiler-feed pump suction is taken directly from the surge tank and is forced through the high-heat-level condenser and No. 3 heater to the boiler at 287 deg. F.

The make-up water evaporator has a capacity of 15,000 lb. per hour, and the raw water is supplied from the house tank or the steam-driven evaporator pump. Steam is supplied from a No. 3 bleeder at 63.7 lb. absolute. Under normal conditions all the auxiliaries are motor-driven, but if a steam-driven auxiliary is placed in service, the exhaust steam is used in No. 2 heater and the second bleeder from the turbine is automatically cut out through reverse-flow valves.

DUPLICATE CIRCULATING WATER PUMPS

The main 25,000-kva. turbo-generator is placed with its axis parallel to the main firing aisle. In the turbine-room floor two large open wells, one on each side of the unit, allow an abundance of light and air to reach the condenser floor. This condenser is set at right angles to the turbine and rigidly secured to the turbine exhaust, being supported on springs which carry approximately 60 per cent of the weight. Circulating water is supplied from two pumps operating at 21,500 gal. per minute. Each pump is directly connected to a 150-hp. squirrel-cage induction motor, while one is also driven by a 50-hp. motor. During periods of high or cold water only the 50-hp. pump is used.

In the electrical bays there are five floors—the first containing all the 400-volt station service buses, with the remote-control switching apparatus, the generator ground-resistance room and the generator field resistance. On the second floor are the cable connections from the generator and outgoing feeders and the current and potential transformer cell structures. The third floor contains the main and auxiliary 13,200-volt buses, and the fourth floor contains the station control room and battery room. Throughout the station all motors are operated by remote control at the machines. A single device operated from the control room is used to notify firemen of load changes on boilers. Two 990-kva., 13,200, 440, 220-volt delta-connected transformers feed the auxiliaries. The bus and station equipment are designed for operation of 25,000 volts, which will be the station voltage in the future, although at present only 13,200 volts is used. Island station was designed and constructed by Toltz, King & Day, Inc., engineers and architects, St. Paul, with the cooperation of W. C. Beckjord, chief engineer of the American Light & Traction Company; D. W. Flowers, chief engineer of the St. Paul Gas Light Company, and his assistant, D. R. Putman. J. P. Crowley is vice-president and general manager.

Advantages of the Electric Vehicle

Careful Study Should Be Made to See that "Electrics" Are Applied in Proper Field—Their Fundamental Superiority Under Certain Conditions Analyzed

By E. M. WATTS
Toronto, Canada

CENTRAL-STATION companies, because of the electric vehicle's load-building value, and apparatus manufacturers, because of the sales possibilities, are vitally interested in the development of electric transportation. As the electric industry itself assumed the responsibility of correcting the shortcomings of the earlier systems of illumination and electric drive for industrial plants, so must it assume the responsibility in merchandising electric transportation. Information and advice on this subject should always be intelligent, thorough and never prejudiced in any way, for any mistake falls upon the user, who in reality determines the ultimate success of the electric truck.

Conservative estimates place the amount of city hauling that can be done by electric motor vehicles at 75 per cent. There were in the latter part of 1922 800,000 motor trucks operating in United States cities of 100,000 or more people. There would, therefore, be the possible opportunity for replacing 600,000 trucks with motor vehicles. Actually the electric vehicles sold total between 3 and 4 per cent of this number. The electric truck has been overshadowed by the enormous development in the use of gasoline-propelled vehicles. The problem of the transportation engineer is to know clearly the fields that belong to various forms of equipment used. To place the electric vehicle in its proper field means the replacing of 100,000 gasoline trucks in the United States yearly, taking the average life of this type of vehicle as six years.

The improvement in storage batteries alone would enable electric vehicles to hold their position as the most economical city transportation unit. The improvement of the principal elements affecting the electric truck further enhance its economic value.

The modern electric truck can be further enlarged in its scope by changing batteries in a few minutes time where warranted.

Horses are gradually becoming eliminated for delivery purposes.

A single horse can cover on an average 15 miles per day hauling a wagon with load varying from 1,000 lb. to 2,000 lb. When teams or more than one horse per route are used the cost per route is out of all proportion to the electric.

Another point is the now established fact that equal capacity equipment of either the horse-drawn or gasoline-truck type does not have so great a maximum pulling power as the electric truck. A horse can exert a pulling force of 120 lb. at about 2½ miles an hour; a team will obviously pull twice that amount. A horse is capable of just so much daily fatigue, and the greater the effort the slower the speed. A team of horses exert a sustained pull of 1,000 lb. at one mile per hour, whereas a ¾-ton electric will have the same tractive effort at the rim of the driving wheel at 4 miles per hour, which is nowhere near maximum. The gasoline truck has a maximum at 5 miles an hour or under, and a ¾-ton gasoline truck would have a pull of 1,800 lb. The chief difference between gasoline truck and electric truck is that the stalling current of an electric is about twenty times normal draw, so that under conditions where the gasoline truck is stalling the electric truck is still well within its maximum pulling ability.

Taking the average delivery route of 20 miles on a straightaway run in the city, the gasoline truck would gain one hour on an "electric," but where there are 60

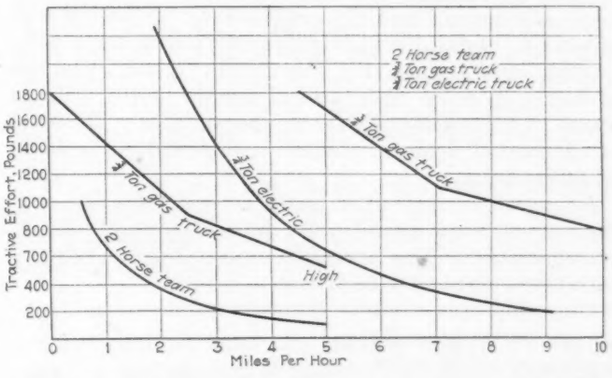


FIG. 1—COMPARATIVE TRACTIVE EFFORT OF TWO-HORSE TEAM AND ¾-TON GASOLINE AND ELECTRIC TRUCKS

to 150 stops involved in the route the time saving in running speed is entirely eliminated and the advantage is with the electric, which accelerates more quickly than the gasoline truck, owing both to electric motor characteristics and to the difference in mechanical operation required to start each type of vehicle.

In frequent-stop service two hours out of an eight-hour day is all that the vehicle is in motion, and the electric maintains a much higher average speed than a horse and higher than a gasoline truck. The physical capacity of the three types of delivery is readily shown by average known mileages as kept by various industries in different cities. (See Table III.)

Figures showing the number of trucks manufactured in the United States show that 83 per cent of all trucks are rated for 1 ton or under. In Table VI, showing delivery costs in typical businesses, all are users of the small type of truck and the figures represent costs of vehicle and driver. The vehicle cost is 10 to 12½ per cent of total so that a saving of 33⅓ per cent on vehicle cost means a saving of 3 per cent of gross income.

The average user of delivery equipment is generally greatly surprised when he learns time and length of routes; the mileage is invariably overestimated by 10 to 25 per cent. Mileage and physical conditions must be

TABLE I—RATIO OF IMPROVEMENT IN STORAGE BATTERIES IN LAST 13 YEARS

	1910	1923
Relative capacity	1.00	1.33
Life	1.00	3.00
Cost	1.00	1.50
Service value	1.00	2.66
Maintenance cost	1.00	0.37

TABLE II—COMPARISON OF ELECTRIC TRUCK CAPACITY AND EFFICIENCY

	Year 1910	Year 1923
Battery—relative capacity	100	133
Wiring—relative efficiency	97	99
Motors—efficiency	78	83
Drive—efficiency	85	95
Tires—efficiency	45	65
Relative mileage range	100	230

TABLE III—AVERAGE MILEAGE OF THREE TYPES OF ELECTRIC VEHICLES

	Daily Average Miles
American Railway Express Company:	
8,200 horse wagons	12
1,400 electrics	20
2,500 gas trucks	28
Brooklyn Dairy:	
85 electrics	19
15 gas trucks	52
New York Bakery:	
125 electrics	18
25 gas trucks	65
Kansas City Bakery:	
100 horses	12
Washington (D. C.) Bakery:	
106 electrics	18
20 gas trucks	50
Chicago Ice-Cream Company:	
35 electrics	19½
10 gas trucks	37½
City of 100,000 (laundry covering complete city):	
22 electrics	19

TABLE IV—COMPARATIVE OPERATING RADIUS

Light Delivery;
Frequent-stop service—two hours' running time.
Single horse— 8 miles at 4 m.p.h.
Electric —20 miles at 10 m.p.h.

Infrequent-stop service—Four hours' running time.
Single horse—16 miles;
Electric —40 miles;
Gas truck —55 miles.

Heavy Hauling;
Teams— 7 miles
Truck—22 miles.

TABLE V—GASOLINE AND OIL CONSUMPTION OF GAS TRUCKS

Tons	Miles per Gallon Gasoline	Miles per Pint Oil
½	9	30
1½	8	27
3½	7	27
5	6	25

carefully determined to have electric truck installations economical and satisfactory. An electric vehicle should not fail because of insufficient battery capacity, nor is it wise to install an unnecessarily large battery, since this involves increased cost and cutting down of the pay load allowable. Retail bread or milk distribution has a daily average of 14 miles for city work; laundry service averages 18 miles daily; departmental stores average about 18 miles daily, with some special trips. The limit of economical field for electric transportation is 45 to 50 miles daily.

By actual analysis of all items entering into the cost, the electric truck provides the most economical kind of transportation. The figures per route for one concern with seven plants are as follows:

	A	B	C	D	E	F	G
Electric	1.12	1.26	....	....	....	....	....
Gasoline	1.35	1.70	....	....	....	....	....
Horses	....	....	2.35	3.5	2.00	2.22	2.00

After considering the number of horses, gasoline and electric trucks that are necessary for any delivery system, the parallel operating cost of each kind of equipment to do the same work should be estimated. A most common misconception is that the investment for electric delivery equipment is greater than that for either horse or gasoline. There is the item of extra equipment, and more especially the item of real estate and buildings for housing and maintaining the equipment, to be considered. The space required for horse and wagon is twice that required for an electric truck. There are also supply rooms, harness room and manure storage. The gasoline unit requires space for servicing and storage for gas and oil. There is no additional fire hazard for storage of electric trucks in a building.

The question of operating costs brings up feed for horses, which varies from $150 to $250 per year per horse. The gasoline truck has a consumption average which gives miles per gallon of gas and per pint of oil as shown in Table V. The figures on consumption are obtained from audits taken and not from any particular run. Government-owned vehicles showed a gasoline consumption of 6.3 miles per gallon for trucks ranging from ½-ton to 1-ton capacity.

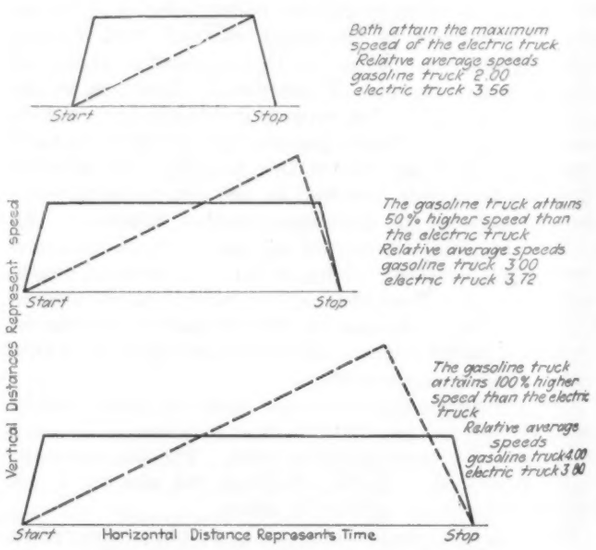


FIG. 2—AVERAGE SPEEDS OF HIGH-SPEED AND LOW-SPEED VEHICLES

This graphical study shows approximately how a low-speed vehicle with a high rate of acceleration would, under conditions of frequent stopping, have about the same or even higher average speed as a high-speed vehicle with a low rate of acceleration.

Cleaning and lubricating costs are generally overlooked in calculating, but they are a considerable item and are less on an electric than a gasoline truck because of the fewer parts in the former. All types of vehicles require chassis and body repairs. The probable life of

TABLE VI—DELIVERY COSTS IN TYPICAL BUSINESSES

Industry	Delivery Cost in Percentage of Gross Income	Cost per Unit
Bakery	18 to 25	2 to 2½ cents for loaf of bread
Dairy	20 to 25	3 to 4 cents for quart of milk
Laundry	20 to 30	20 to 30 cents for $1 bundle
Ice-cream places	20 to 25	8 to 10 cents for quart of ice cream
Department stores	20 to 25	8 to 12 cents for parcel

TABLE VII—ENERGY CONSUMPTION OF BATTERY AT VARIOUS GRADES*

Per Cent Grade	Consumption	Per Cent Grade	Consumption
Level	100	4	260
1	140	5	300
2	180	6	340
3	220		

*Index 100.

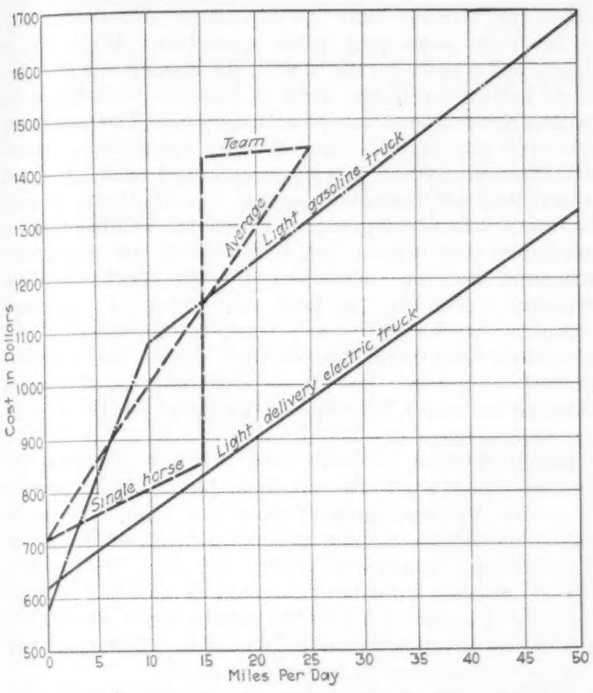


FIG. 3—COMPARATIVE YEARLY OPERATING COSTS OF HORSE AND WAGON, LIGHT GASOLINE TRUCK AND LIGHT ELECTRIC TRUCK

a chassis is taken as from 25,000 miles to 50,000 miles and costs are figured accordingly. With some equipment the expenditure for parts has been known to be as high per year as the original cost of the chassis. The simplicity of electric trucks limits the number of wearing parts. The engine and cooling system, the ignition and carburization system, the clutch with its frictionless linings and release bearings and the transmission are entirely eliminated.

Painting will be the same for each type of truck, its cost being governed by the degree of pride the owner takes in his equipment. The electric truck has less vibration. This cuts down body repairs, and as it moves more slowly than a gasoline truck fewer risks are taken by drivers in traffic. It costs less to keep tires in repair on an "electric" per mile than it does to keep a horse properly shod. The tendency to speed in a gasoline truck wears tires, and the life of tires is taken as 8,000 miles for gasoline and 10,000 for electric.

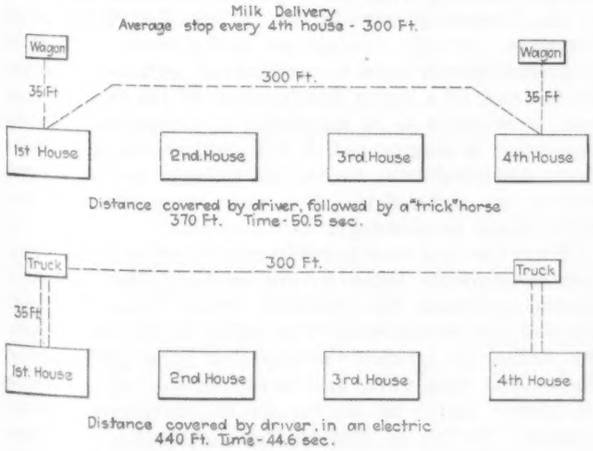


FIG. 4—MILK DELIVERY BY HORSE AND WAGON AND ELECTRIC TRUCK

Battery expense is peculiar to the electric truck, but the costs for purchase and vehicle upkeep include all battery charges. The battery cost is calculated over a period of ten years. The largest item is depreciation, which involves setting up a reserve for purchase. With a battery cost of $1,000 and renewal every four years through an allowance of $200, the investment would be $800 every four years. The battery cost can, therefore, be closely estimated in advance. Interest on investment is not generally calculated, especially in case of electric trucks, which, because of long life and other inherent advantages, are considered an equipment investment. When it is included it should be taken as 3 per cent of undepreciated cost.

Average horse life in service can be taken as five years. A concern with a number of stables shows:

	A	B	C	D	E
Number of routes.....	20	32	32	26	46
Number of horses.....	47	80	64	63	96
Horse depreciation.....	$2,668	$3,608	$4,106	$3,984	$6,912

Gasoline equipment is generally depreciated at the rate of 20 to 33⅓ per cent per year, whereas light equipmen on frequent-stop service is worn out in two years. The depreciation on electric trucks is 10 per cent, but in New York City there are 1,580 electric trucks more than ten years old, 1,285 more than eleven, 980 more than twelve, 895 more than thirteen, 221 more than fourteen, 156 more than fifteen, 132 more than sixteen, 106 more than seventeen, 74 more than eighteen, 33 more than nineteen and 25 more than twenty-two years old.

The electric truck has shown great improvements in the last ten years—more so than any other vehicle—and therefore the life of an "electric" can be reasonably expected to better the record for New York City.

GARAGE COST

The usual allowance for garage help is $1,800 per year for care of eight to fifteen "electrics." For fifteen to twenty-five trucks an allowance of $3,000 is made. These figures are considerably under averages for both horse and gasoline equipment. Taking a specific case, a certain plant had fifty-nine horses and forty-three 1-ton gas trucks. The cost per horse per year for stable help was $191 and the cost per truck per year for garage help was $364. A fleet of sixty-three electric vehicles shows a cost per year per truck of $109 for garage help.

The delivery problems of many businesses, after being carefully analyzed, are solved satisfactorily by electric trucks. The market for the electric truck is governed by the amount of work rightly adapted to it. Contrary to the prevailing idea, the greater speed attainable with the gasoline truck avails nothing in congested traffic. The electric truck will do its legitimate work at the same speed, or better, than the gasoline truck doing the same work. Maintenance costs are the largest items of operating costs, especially with gasoline equipment operated at excessive speed. It is a notable fact that the better grades of gasoline trucks of 2 tons capacity or over are not guaranteed if run in excess of 15 miles per hour, and a conservative policy is to govern trucks to a maximum speed of 15 miles.

Great care should be taken in recommending the proper truck for the type of service to be rendered. Too little responsibility has been taken in the past in

ordering delivery equipment. The data survey should include:

1. Loads—average and maximum.
2. Mileage—per trip and per day.
3. Road conditions—summer and winter.
4. Distribution of time per day between running and standing.
5. Number and percentage of grades.
6. Number of stops.

Study of conditions may further show a possibility of consolidating or redistributing routes.

Letters from Our Readers

Unarmored Cable Installations in Italy

To the Editor of the ELECTRICAL WORLD:

In the ELECTRICAL WORLD for December 6, 1924, page 1211, J. Hill, Jr., says that there has been installed in Shreveport, La., about 15 miles of single-conductor unarmored underground cable, which is in successful operation. In Turin, Italy, of 250 km. of underground cables installed for street lighting, 25 km. consists of single-conductor, paper-insulated, lead-sheath, jute-covered cables, copper cross-section 6.6 sq.mm., 4,000 volts, and 35 km. of unarmored cables of the same type but rubber-insulated, copper cross-section 8 sq.mm., 1,000 volts. These cables were purchased in 1920 owing to their notably smaller first cost as compared with armored cables and are laid along the sidewalks of the thoroughfares and alleys, with a cover of sturdy tiles, in trenches 60 cm. deep. Their behavior has been quite satisfactory, no more trouble being experienced than with armored cables. Grounds and interruptions average four a month on the whole underground street-lighting system. Most of the cables, however, are steel-taped, a small part steel-wire-armored, and all have been laid alike under tiles or a brick cover.

GUIDO PERI,
Chief Engineer of the Servizio Tecnologico Municipale.
Turin, Italy.

Questionnaires Not Always Conscienceless

To the Editor of the ELECTRICAL WORLD:

While there is much to be said against the excessive use of the "conscienceless questionnaires" criticised in your editorial of March 14, there is still something to be said on the other side. There are many organizations and committees whose object, among other things, is to present to the public the facts and figures of the electrical industry in a comprehensive form, with the hope that when the public has this accurate information a better understanding will result, inuring to the benefit both of the corporations and the public. In addition to this there are state and national associations whose function is to further the progress of the industry through reports and policies formed upon comprehensive, widespread data.

Any one who becomes acquainted with any of these organizations is immediately disillusioned as to the degree of co-operation received, not only in response to questionnaires, but even in reply to the most rational and legitimate inquiries. The wastebaskets in many cases apparently yawn not alone for questionnaires, but also for requests of even the most elementary character.

Nobody sends out questionnaires simply for the fun of asking questions, but because there is a logical need for the definite information asked for. The editorial takes the attitude that the companies are conferring a favor in answering these questions. It is not a favor but a duty to those who are attempting to fight their battles for them—with, it must be admitted, very poor support from the great majority. The electrical industry has become one of huge complexity, whose ramifications extend into every phase of social life and every field of industrial endeavor. If there is any business where comprehensive general information is necessary and where the simplest of the governing economic laws are unknown, it is the central-station industry. The day is long past when the average company can follow its own way; interconnection and interstate lines have changed that. State and national tendencies govern, and these can only be discerned through collective information gathered by the use of questionnaires.

Surely it must be recognized that the electrical industry is not a private business, but a public service in which the management does not enjoy the same rights as to life, liberty and the pursuit of dividends that ordinary commercial enterprises do. The furnishing of complete information should be as much a function of the organization as the generation of electricity, and bona-fide questionnaires should be answered, even if a special man has to be hired to do it.

Only through the exchange of complete, nation-wide information can the electrical industry continue to prosper in the complex territorial field which it now occupies. Yawning wastebaskets mean narrow, niggardly policies, provincial points of view and ultimate stagnation.

PRO BONO ELECTRICO.
New York, N. Y.

Power Factor, Terminology and the Layman

To the Editor of the ELECTRICAL WORLD:

In your issue of February 28 O. A. Kenyon states that the units employed in electrical measurements, and specifically the loose use of the term "current," are responsible for a good deal of mystery in the layman's mind. After giving us his views as to the real meaning of this term, he suggests as a means of improving the situation that the customer be told that there are two kinds of electricity! Is it not going to intensify the "mystery" to talk of "two kinds of electricity"? Would this not clearly be a worse offense than to say that "the price of current is 10 cents per kilowatt-hour"? And will it not be necessary for all of us to keep Mr. Kenyon busy explaining what this second kind of electricity is?

Mr. Kenyon goes on to say: "This electricity, while required, ... does no useful work." If it is required, then it must be performing some useful work. In the case of a motor the function of the lagging current component is to magnetize the machine. Unless the latter is magnetized, it will neither run nor transform electrical into mechanical energy, and it is well not to lose sight of this fact when proposing modifications in the terminology.

What the customer is really interested in is the number of amperes taken by his motor. The customer should purchase the machine which takes the least current per horsepower. The public utility should base its charge on current consumption at a given power factor less than unity and thus eliminate all questions of power factor in so far as the customer is concerned. To try to explain the significance of power factor to the layman is a hopeless and, I think, useless undertaking.

VAL A. FYNN.
St. Louis, Mo.

Central Station and Industrial Practice

Economy of Preheating Wood Electrically

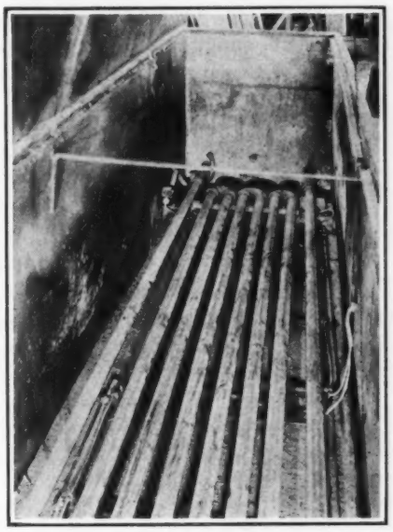
BY J. L. FADEN
Edison Electric Illuminating Company, Boston, Mass.

PREHEATING the wood before gluing, in order to secure a tight bond, is one of the ways in which Horn Brothers of Boston, who operate a shop for the manufacture of cabinets and interior finish, improve their product. If the glue is applied hot, it runs into the pores of the wood, assuring a very close joint. For a number of years the firm used a steam-heated box for this operation, and during the summer months it was necessary to run a small steam boiler solely for heating this box and the glue pots. About a year ago it was suggested that a saving could be realized by heating this box electrically instead of by steam.

The top of this box, which is 12 ft. 6 in. long, 2 ft. 6 in. wide and 2 ft. 6 in. deep, is divided into two sections so arranged that either can be opened as desired. The interior of the box is lined with asbestos protected by sheet metal. The steam coil is in the bottom. As it was the original intention to heat the box in summer by electricity and by steam in the winter, the steam coil was left intact and the electric heating elements placed at right angles underneath.

There is about 34 sq.ft. of steam-pipe radiating surface in the coil, and it was estimated that about 2½ kw. would be sufficient to maintain the desired temperature. In order, however, to reduce the time of heating up in the morning, 4 kw. was installed, the equipment consisting of eight 500-watt Westinghouse space heaters. These were so arranged on a double-throw switch that either full or half heat could be obtained whenever desired.

Soon after the equipment was in operation it was found that it was necessary to leave the high heat on for only a short time in the morning. The switch could then be thrown to the half-heat position for the rest of the day.



INTERIOR OF BOX, SHOWING HOW ELECTRIC HEATERS WERE PLACED UNDER OLD STEAM PIPES

At the time the wooden box was electrified it was also decided to do away with the steam-heated glue pots. A circuit was run along underneath the workbenches with outlets arranged at convenient points. Electric glue pots were then installed. This arrangement proved much handier for the workman, for he had the glue at his bench and did not have to walk across the room as when the steam-heated pots were used.

As stated above, it was the original intention to use the electrical equipment only during the summer, but as experience showed that the operation was economical and convenient, the owner is now considering using the electrified equipment the year round.

The cost of this installation amounted to about $225, including three electric glue pots, eight 500-watt space heaters and all necessary wiring, both for the glue-pot circuit and for the wooden box. This includes a run of about 50 ft. of wire from the service entrance. The average monthly energy consumption of the equipment is 370 kw.-hr., which at 3 cents per kilowatt-hour amounts to about $11.

Benefits of Power-Factor Correction

TO SEE what specific power-factor-correction advantages could be obtained from paralleling a 15-hp. Fynn-Weichsel motor with standard squirrel-cage induction motors was the purpose of a test made by the American Can Company in its Los Angeles plant on September 24, 1924. Ten tests were made as shown in the accompanying table. As this motor was the only one of its type installed in a plant of several hundred motors, it was impossible to determine the effect of this motor on the over-all power factor of the plant. Since the power factor is not taken into consideration in making power

TEST DATA OBTAINED BY AMERICAN CAN COMPANY ON PARALLELING ONE 15-HP., 1,000-R.P.M., 50-CYCLE, 220-VOLT FYNN-WEICHSEL MOTOR WITH STANDARD INDUCTION MOTORS

Test No.	Motors Under Test	Load in Horse-power	Total Kilo-watts	Wattmeter Readings in Kw. A Phase	Wattmeter Readings in Kw. B Phase	Ammeter Readings Phase A	Ammeter Readings Phase B	Ammeter Readings Phase C	Average Amperes per Phase	Phase Volts A	Phase Volts B	Phase Volts C	Average Volts	Per Cent Power Factor
1	Fynn-Weichsel motor only with full load	15.0	11.2	7.4	4.1	33	30	33	32	239	238	239	238.7	84.6 lead
2	Fynn-Weichsel motor only with full load	13.8	10.3	6.5	4.2	31	27	31	29.7	237	237	238	237.3	84.5 lead
3	Fynn-Weichsel with normal load as at present	10.2	7.6	4.5	3.0	22.3	18.4	22.5	21.1	239	239	240	239.3	87.0 lead
4	Fynn-Weichsel with approximately 26 per cent overload	19.0	14.2	8.5	6.0	69	36	39	38	239	239	240	239.3	90.3 lead
5	Two 7.5-hp. induction motors in parallel, 4½-hp. each	9.5	7.1	0.2	7.5	32	32	33	32.3	238	237	238	237.7	53.4 lag
6	Fynn motor in parallel with above 7.5-hp. induction motors	22.5	16.8	6.4	10.8	43	43	47	44.3	237	237	239	237.7	92.2 lag
7	Fynn motor in parallel with three 7.5-hp. induction motors	25.8	19.2	7.6	13.6	54	54	58	55.3	237	237	239	237.7	84.4 lag
8	One 5-hp. slip-ring induction motor in double seamer	3.6	2.7	0.3	2.3	9.6	10	10	9.9	238	238	239	238.3	66.2 lag
9	Two 5-hp. slip-ring induction motors in double sealers	7.0	3.2	1.7	5.5	19.3	20.2	20	19.8	238	238	239	238.3	63.7 lag
10	Fynn motor in parallel with above 5-hp. motors	15.8	11.8	6.0	8.5	28.02	28	32	29.4	238	238	239	238.3	97.4 lag

contracts, the company was unable to determine what savings in energy cost could accrue from the increased power factor due to this motor.

This 15-hp. Fynn-Weichsel motor was not operating at full load at the time of the test, as is clearly shown by the power-factor reading of 87 per cent, leading, compared with 84.6 per cent when tested under full load.

The extent to which an induction motor operates at low power factor was determined by placing the Fynn-Weichsel motor in parallel with various induction-motor types. On test No. 5, using two 7.5-hp. induction motors in parallel, the power factors read 53.4 per cent lagging; by placing the Fynn-Weichsel motor in parallel this power factor was increased to 92.2 per cent lagging. Tests 8 and 9 show similar results, increasing the power factor from 66.2 to 97.4 per cent on two 5-hp. induction motors.

A study of two Fynn-Weichsel motor installations at Warren, Ohio, presents similar results for both plants. On each installation the most notable improvement has been an increase in power factor which was required by the local public utility company.

"The saving of 10 to 15 per cent of the regular monthly bills by the Federal Machine & Welder Company is not so much due to power-factor correction alone as to the more efficient motors," declared F. P. McBerty, general manager. "For the past two months we have been working these motors very hard, but we have had no difficulty with them."

Tests made by the power company at the plant of the Trumbull Manufacturing Company show that while the old monthly power factor had averaged around 62 per cent, the new power factor is around 81 per cent.

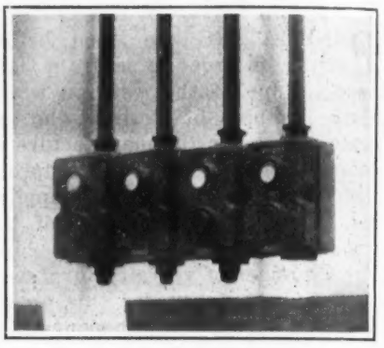
M. L. Derge, general manager of this plant, said: "Our saving has been, on an average, $14 to $15 a month over previous months of this year. The only reasons why we did not choose static condensers were their first cost and inconvenience in operation. The load on the plant was not great enough to warrant the additional expense of a synchronous condenser."

Special Transformer Connections

WHEN the Utica Gas & Electric Company changed its distribution system from 2,300 volts, two-phase, four-wire to 4,000 volts, three-phase, four-wire a number of special transformer connections were necessary in order to serve the power loads connected to the system. Some of these are given in the accompanying illustrations and might prove of use and value to other companies that are making a similar change or that encounter the problem of a special transformer connection.

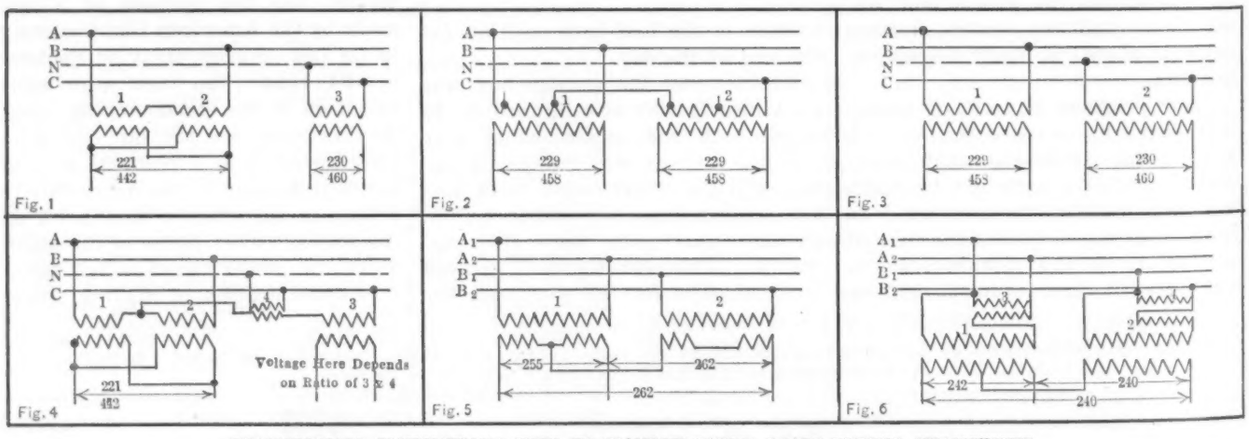
Push-Button Control for Conveyor Motors

A TWO-WAY fruit conveyor in a California cannery is so arranged that the fruit can be delivered to any section of the cutting tables to either of the two lines of fruit scalders in the process room. A special push-button control for



CONVEYORS IN FRUIT CANNERY OPERATED BY REMOTE CONTROL

the motors driving the conveyors is conveniently located in the process room. The operators can instantly stop the conveyors in case something should go wrong with the equipment in this room and it should be desired to stop the flow of fruit. A battery of control buttons is installed centrally in the process room and is placed overhead within easy reach of the operators as shown in the accompanying illustration.



TRANSFORMER CONNECTIONS USED TO HANDLE POWER LOADS DURING CHANGEOVER

Fig. 1—Three-phase, four-wire, 2,300/4,000-volt, Y to two-phase, four-wire connection. Transformers Nos. 1 and 2 rated at 1,980/220/440 volts, each one-half the size of No. 3. No. 3 rated at 2,200/220/440 volts.

Fig. 2—Three-phase, four-wire, 2,300/4,000-volt, Y, to two-phase, four-wire T connection. Transformer No. 1 rated at 4,000/230/460 volts with 86.6 per cent and 50 per cent taps. No. 2 teaser transformer rated at 4,000/230/460 volts with 86.6 per cent and 50 per cent taps. These transformers are interchangeable.

Fig. 3—Three-phase, four-wire, 2,300/4,000-volt, Y to two-phase, four-wire connection. No. 1 transformer rated at 4,000/230/460 volts and No. 2 at 2,200/220/440 volts. Phases are shifted on adjacent banks to relieve neutral load.

Fig. 4—Three-phase, four-wire, 2,300/4,000-volt, Y to two-phase, four-wire connection. Transformers Nos. 1 and 2 rated at 1,980/220/440, each one-half the size of No. 3. No. 3 is an odd voltage and ratio transformer. No. 4 is a boost or buck transformer of proper size 2,300-volt primary and proper ratio to give the required voltage across No. 3 to obtain a practical balance of secondary voltages.

Fig. 5—Two-phase, four-wire, 2,300-volt, to three-phase, three-wire connection. Transformer No. 1 rated at 2,200/122/244 volts or 2,200/244/488 volts. No. 2 rated at 2,200/110/220 volts or 2,200/220/440 volts. Nos. 1 and 2 may be odd voltage and ratio transformers and a perfect secondary balance be obtained by putting the proper boost or buck transformer in phase A or phase B or in both phases.

Fig. 6—Two-phase, four-wire, 2,300-volt, to three-phase, three-wire connection. Transformers Nos. 1 and 2 rated at 2,200/110/220 volts or 2,200/220/440 volts. No. 3 is a 5 per cent boosting transformer rated at 2,200/110/220 volts. No. 4 is a 10 per cent bucking transformer rated at 2,200/110/220 volts. Transformer No. 3 may be omitted. The secondary voltages will be unbalanced but still suitable for practical operation.

Fire Resistance of Cable Fireproofing

Tests as Conducted by the Brooklyn Edison Company on Various Materials Described—Comparison Also Made of Heat-Conducting Properties of Samples

AN INVESTIGATION to determine the relative merits of various fireproofing materials for underground cables, as made by the Brooklyn Edison Company, was described by W. F. Davidson of the above company before the recent convention of the Empire State Gas and Electric Association at Syracuse, N. Y. Since this convention further tests have been conducted and these are described below.

As a result of the tests it was found that cement fireproofing has about the same ability to resist the destructive action of an external arc as asbestos fireproofing. The work also showed that the placing of fireproofing material on the cables required skilled workmanship, for if the mechanical properties are not satisfactory, the fireproofing is liable to be cracked and dislodged by handling or bending. The use of cement was not recommended by this company, but in the discussion following the paper several engineers told of experiences in which cement fireproofing had been found advantageous. According to Mr. Davidson, asbestos fireproofing is easy to apply and the mechanical properties are somewhat better. He recommended its use.

In preparing cables for cement fireproofing a paraffin cotton covering was used to protect the lead sheath from possible electrolytic action. Rope wound tightly over the paraffined cotton tape was used as a binder. "Niagrite" asbestos was used on samples made up for comparative tests in conjunction with a fire-resisting cement or clay called "Asbestoment" and furnished by the Johns-Manville Company.

Description of Test Pieces

No. I. Cement Fireproofed Joint.—A section of three-conductor, 350,000-circ.mil, 13,000-volt cable was prepared to stimulate a complete cable splice with four thermocouples inserted so that they were 11 in. apart between a "Conducel" cylinder and the inner surface of the lead sleeve. The cement proofing was applied to a thickness of about ½ in. The outside diameter of the fireproofed test piece was 6¾ in. The cement was composed of three parts portland cement and four parts sand.

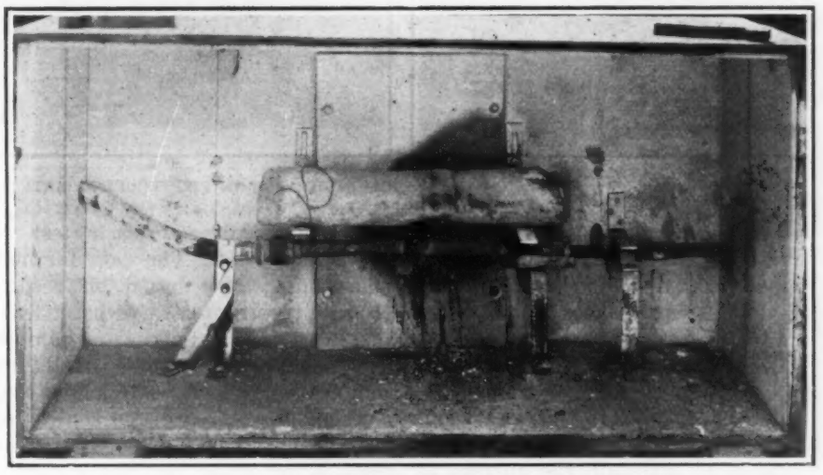
No. II. "Niagrite" Fireproofed Joint.—A joint was made with thermocouples inserted and then a covering of two layers of "Niagrite" asbestos dipped in immersion fluid was wound over the joint and a finishing fluid applied. The thickness of "Niagrite" covering was about ⅝ in. and the outside diameter of the fireproofed joint about 7 in.

No. III. Cement Fireproofed Cable.—A section (4½ ft. long) of three-conductor, 350,000-circ.mil, 13,000-volt cable was drilled at the center in one place partly through and in another place 1½ in. away completely through for intersecting thermocouples. Thermocouples were soldered to one of the copper conductors between the lead sheath and the paper insulation of the cable. The cable was then fireproofed with cement as described for test piece No. 1. The thickness of cement covering was about ½ in. and the outside diameter of the fireproofed cable about 4½ in.

No. IV. "Niagrite" Fireproofed Cable.—A section of cable was prepared as described in test piece No. III and "Niagrite" asbestos fireproofing applied, as described for the test piece No. II. The thickness of "Niagrite" was about ⅝ in. and the outside diameter of the fireproofed cable was 4¾ in.

No. V. "Niagrite" and "Asbestoment" Fireproofed Cable.—A section of cable with thermocouples was arranged as described for test piece No. III. A layer of "Niagrite" asbestos with cloth backing dipped in immersion fluid was wound over the cable. Over this was applied "Asbestoment" to a thickness of ⅝ in. The "Asbestoment" was prepared with water so that it had the consistency of soft putty, and this was rubbed on to the desired thickness. The thickness of "Niagrite" and "Asbestoment" was ⅝ in., and the outside diameter of the fireproofed test piece was 4¾ in.

No. VI. "Asbestoment" Impregnated "Niagrite" Fireproofed Cable.—A section of cable with thermocouples was arranged as described for test piece No. III. "Niagrite" asbestos with cloth backing was immersed in a thin solution of "Asbestoment" and water of a consistency of paint. A single layer of the impregnated "Niagrite" was applied to the cable, and by working with the hands the spaces between turns were completely filled with "Asbestoment." The thickness of impregnated "Niagrite" was ⅝ in. and the outside diameter of the fireproofed cable was 3⅞ in.



APPARATUS FOR CONDUCTING CABLE FIREPROOFING TESTS

Notes on Test Pieces.—Fireproofing of cables with cement or "Asbestoment" requires skill to insure a uniform thickness of material. These substances on hardening are liable to crack. The time required to apply the cement or asbestoment is two or three times as long as that required for "Niagrite."

The apparatus for conducting the tests and the action of arcs on the fireproofing material will now be con-

TABLE I—SUMMARY OF TESTS ON CABLE FIREFPROOFING MATERIALS

Type of Test Piece	Number of Tests	Condition	Electrodes	Kilowatt-Seconds, Average	Remarks
I	1	Normal	Copper	7,500	30 deg. C. rise—No failure of lead
II	1	Normal	Copper	7,000	8 deg. C. rise—No failure of lead
III	6	Normal	Carbon	6,300	Tested until lead melted; poorest piece 3,500.
	2	Immersed	Carbon	13,800	Tested until lead melted.
	2	Bent	Carbon	7,600	Tested until lead melted.
IV	11	Normal	Carbon	8,400	Tested until lead melted; poorest piece 4,400.
	3	Immersed	Carbon	9,800	Tested until lead melted.
	2	Bent	Carbon	7,100	Tested until lead melted.
V	5	Normal	Carbon	14,300	Tested until lead melted; poorest piece. 12,200.
VI	5	Normal	Carbon	15,700	Tested until lead melted; poorest piece 8,800.
	4	Bent	Carbon	12,000	Tested until lead melted.

sidered. The tests were made in a manner to establish conditions similar in kind, if not in severity, to those obtained in a manhole when a short circuit occurs.

In the first seven tests a series of explosive arcs were established by bringing two copper electrodes together almost directly beneath the test specimens, as shown in the accompanying illustrations. This proved a severe test as particles of molten copper were projected for a distance of from 15 ft. to 20 ft. from the test pieces. From 2 lb. to 2½ lb. of copper was melted by the arc in each test. The current was approximately 1,000 amp. and the voltage across the arc about 70. In the first four tests the distance between the copper electrodes and the fireproofing on the test piece was about 3 in. and in following tests 1 in.

The remaining eighty-four tests were conducted using carbon electrodes 1½ in. in diameter and about 12 in. long. Ballast resistance was adjusted to maintain the current at about 1,000 amp., which corresponded, roughly, to 120 volts across the arc. This arc was maintained until the fireproofing was destroyed. An observer viewing the progress of each test was able to determine quite accurately the first appearance of molten lead.

In all tests instrument readings were taken at ten-second intervals, and from these the average results were calculated. A summary of the principal results of each test is given in Table 1. The data for normal samples are based on results from forty-five tests, with at least three tests on each kind of sample. The results of seventeen tests on samples after forty-two hours' immersion in water are also shown for five types of fireproofing. Fourteen tests were made on five different types of fireproofing to determine the effects of bending.

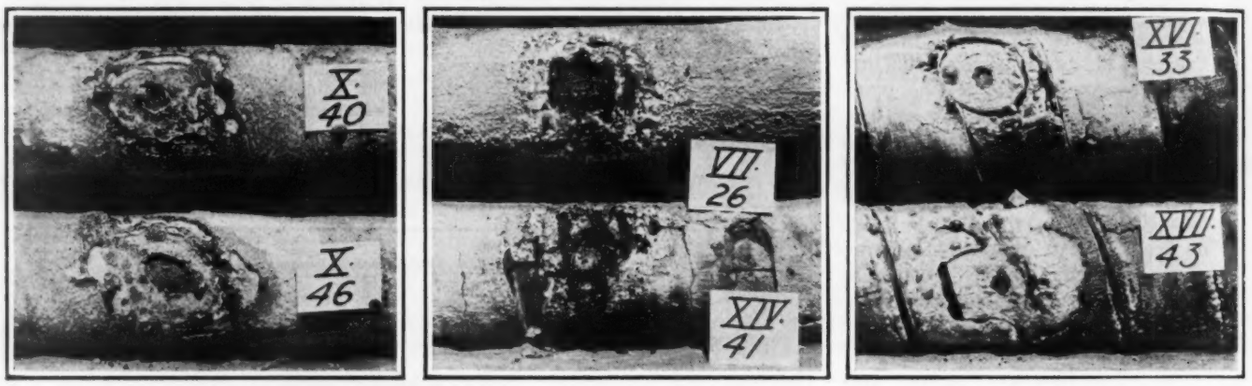
A typical set of readings taken during a test is given in Table II.

A comparison was then made between cement fireproofing and "Niagrite" asbestos fireproofing with respect to their heat-conducting properties. These tests were made on lead sleeves 5¾ in. in outside diameter, representing externally a standard splice on a three-conductor, 350,000-circ.mil, 13,000-volt cable. A heating coil wound over a wooden frame was inserted at one end—the bottom of the test piece—with a lead brought out at each end of the sample. The test piece was filled with No. 6 "Transil" oil, and thermometers were inserted for temperature measurement. The test pieces were covered, using cement fireproofing and "Niagrite" asbestos fireproofing. The power input was measured and the temperature of the oil taken from the reading of the inserted thermometer. A summary of this test is given in Table III.

Compared with the "Niagrite" asbestos fireproofing the cement fireproofing showed a heat conductivity 25 per cent greater. This is a true measure of heat conductivity since the thickness and area of heat insulation were the same in each case.

TABLE III—HEAT CONDUCTIVITY TESTS OF FIREPROOFING MATERIALS

Test Number	Description of Test Piece	Power Input, Watts	Temperature Rise, Deg. C.	Rate of Heat Flow, Watts per Deg. C
1	"Niagrite" fireproofed	139.4	62.2	2.24
2	"Niagrite" fireproofed	75.8	35.0	2.16 (avg. 2.20)
3	Cement fireproofed...	136.0	50.6	2.69
4	Cement fireproofed...	85.5	31.2	2.74
5	Cement fireproofed...	108.5	38.9	2.79 (avg. 2.74)



ACTION OF ARCS ON FIREPROOFING MATERIAL

TABLE II—TEST NO. 33 ON TEST PIECE NO. XVI

Time Hr.Min.Sec.	Time Interval, Sec.	Supply Voltage, Volts	Rheostat Voltage, Volts	Current Amp.	Arc Voltage, Volts	Arc Power, Kw.	Arc Energy, Kw.-Sec.	Remarks
1:44:50		238	238	0	0	0	0	Asbestos fireproofing "A" (two layers of "Niagrite") immersed in water 42 hours.
1:44:56		Start of test						
1:45:05		220	90	900	130	117		
1:45:15		220	90	870	130	113		
1:45:25		219	90	920	129	118		
1:45:35		219	100	930	119	111		
1:45:45		218	100	1,020	118	120		Separation between fireproofing and carbon electrodes, 1 in.
1:45:55		213	102	1,200	111	133		
1:46:05		220	90	980	130	128		
1:46:15		219	102	1,020	117	119		
1:46:25		220	100	1,000	120	120		
1:46:31	95	End of test			Average	120	11,400	

Surface of fireproofing affected, 8 in. x 4 in. Lead melted, ¾-in. diameter.

Pipe-Driven Grounds

THE practice of the Utica Gas & Electric Company in making grounds for grounding equipment is to drive three 1-in. pipes 7 ft. long into the ground spaced at the corners of a 36-in. equilateral triangle. For larger-capacity, high-tension arresters, substation neutral grounds, etc., three of the above unit grounds are installed, the units being at the corners of a 12-ft. equilateral triangle.

Once a year the top soil is removed from around the top of each driven pipe to form an inverted cone, and the earth is then thoroughly saturated with salt brine before replacing the soil removed.

Adequate Protective Systems

Relations Between Power Company, Municipal Inspection Departments, National Electrical Code and Underwriters' Inspectors Discussed in Detail

BY S. W. BORDEN
President Groundulet Company, Newark, N. J.

THERE is little doubt that the electric utility has ample authority to insist upon thoroughly adequate protective measures upon the customer's premises, such protective measures being installed at the customer's expense. Public utility commissions and the courts have sustained the utility in this respect. The fact remains, nevertheless, that a very large percentage of our utilities have no definite and detailed regulations as to protective systems on the customer's premises, nor even an established procedure for assuring themselves that the regulations of the National Electrical Code, as they may be interpreted by themselves or any one else, are actually carried out, and this in spite of the fact that the necessity for and the difficulty of assuring entirely adequate protective grounding is becoming constantly greater because of the general increase of potentials used for local distribution, the increasing tendency toward the use of high-tension systems with grounded neutrals and the general increase in the size and capacity of systems.

UNDERWRITERS' AND CITY INSPECTION

The Underwriters' inspector is the representative of the fire insurance company. He inspects the wiring in the interests of his company in order that the losses to the company due to damage by fire may be kept at a minimum. The purpose of the Underwriters' inspection is primarily to protect the interests of the insurance company. Because of the confidence reposed in him—for in perhaps the majority of cases his inspection is practically the only inspection which is made—he must and should feel a considerable responsibility for the customer's protection, but this is not his principal interest nor is it the service for which he draws his pay. Furthermore, he is working for a fire insurance company and not a life or accident insurance company. The fire insurance company, in the last analysis, will permit the customer to assume almost any risk he may desire if he pays an appropriate premium.

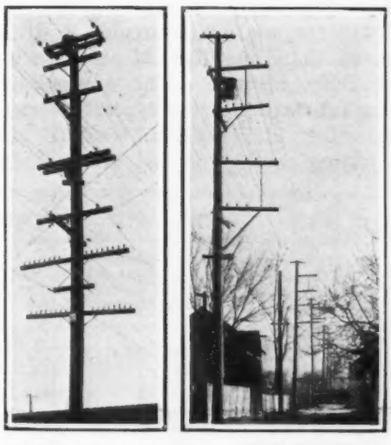
The municipal city inspector is employed by the city, and it is his duty to inspect all electrical wiring in order that the city may be assured that its ordinance or other regulations are complied with. The primary object of all city regulations is to protect the public from unnecessary hazards. There is no selfish motive involved, and unless the city bureau does protect the public against unnecessary hazards it fails to justify its existence and its cost. The public has a right to expect that, having created a city inspection department and being taxed for its support, it will receive the best possible protection which may be reasonably provided. The authority invested in most city inspection departments is limited to the requirements of the National Electrical Code, but the National Electrical Code is merely a minimum standard, and it would appear to be the unquestionable duty of the municipal authorities to insist upon the best possible protection obtainable within the limitations of their authority. It may fairly be said that there is nothing in the National Electrical Code to prevent the formulation and enforcement of entirely adequate protective measures. The city bureau's responsibility to the public is direct and unconditional, and this is, *prima facie*, the only reason for its existence.

THE PUBLIC UTILITY COMPANY

The public utility company, generating, transmitting and distributing electrical energy to the public at large over and under public and private ways, must necessarily assume complete responsibility for providing every reasonable protection against the hazards involved, the Fire Underwriters and public authorities to the contrary notwithstanding. The utilities have undoubtedly taken upon themselves this moral responsibility, and as a matter of keeping the faith, of public policy and general business principles, they cannot afford to disregard it. If considered from none other than a selfish motive, they cannot and should not attempt to pass the responsibility on to Underwriters' inspection bureaus as is being done in a great many cases. There is perhaps more justification for leaving the matter in the hands of city bureaus, but it must be remembered that the inspection by the latter seldom goes beyond the wiring on the customer's premises, whereas adequate protection must involve much more extensive considerations.

To design a good protective system not only requires a thorough knowledge of interior wiring, but the entire characteristics of the electrical system from the generating station to the customer's premises must also be taken into consideration, and it is doubtful whether there is any organization other than the utility itself which is in a position to insure that the prescribed methods will be adequate. Considering the moral responsibility resting upon the public utility in this respect and the serious consequences of a fatal accident or a serious fire resulting—either actually or presumably or so reported—from the presence of an electrical distribution system with respect to the public relations and the commercial prospects of the company, it is difficult to understand why the utilities generally do not recognize and assume more generally their responsibility in this respect.

Joint-Pole Construction on the Pacific Coast



Left—A joint-pole lead in an alley in Sacramento, Cal. Two power companies and the telephone company are in combination here. The top arm carries a fire-alarm circuit and the next four line arms are primary and secondary respectively of the two central stations. The lower arm carries a hundred-pair telephone cable. Right—Another joint pole in Sacramento. Both power companies have transformers on this pole. The telephone company has two sixteen-pin arms carrying open circuits and an arm carrying a cable. There is no alley in this case and the pole lead is set on the rear property line.

Commercial Activities and Public Relations

Year's Appliance Sales Add $60,000 Revenue

THE merchandising activities of the Idaho Power Company, Boise, Idaho, in its four divisions for the year 1924 resulted in a total sale to consumers of approximately a quarter of a million dollars' worth of electrical appliances of all kinds. In the territory served by the company there are 22,261 residential customers, making the average sale per residential consumer for the year more than $15. The average sale in the highest division was $20 and in the lowest division was more than $13 per residential customer. After deducting all expenses the merchandise department showed a reasonable profit and added an additional load of more than 5,000 kw. to the system, with an estimated increased gross annual revenue of more than $60,000.

The company maintains appliance stores in connection with its district office in all divisions, the largest of these being in Boise. Special campaigns are run each year and a steady, aggressive sales effort is put forth to build up a larger appliance load. In addition to the smaller appliances, the Idaho Power Company handles washing machines, vacuum cleaners, electric ranges and water heaters. The company now has a total of close to six thousand range and four thousand water-heating consumers on its system, and this number is constantly being increased from year to year.

A very aggressive sales program has been laid out for 1925, and the Idaho Power Company looks forward to one of its best years in volume of new business.

Many "Prospects" Result from Electric Heat Show

REPORTS from nine manufacturers who exhibited at the industrial electric heating show in Boston last fall, under the auspices of the Power Bureau of the N. E. L. A. and in connection with the convention of the American Society for Steel Treating, indicate that a total of 382 active "prospects" for new business were obtained and that installations in sight total 10,185 kw. Of this, 7,585 kw. is in oven and furnace applications and 2,600 kw. in welding and riveting. If these prospective contracts are all closed, there will be added to central-station outputs 9,455,000 kw.-hr. per year, of which 8,789,000 kw.-hr. will be in oven and furnace work and 666,000 kw.-hr. in welding and riveting.

At an average of 1.5 cents per kilowatt-hour, this business would yield $131,835 in central-station income from the oven and furnace applications and $9,990 from the others, or a total of $141,825. V. M. F. Tallman, chairman of the power committee, Commercial National Section, N. E. L. A., says this shows conclusively that there is a large potential industrial electric heating business available to properly trained central station commercial men.

Another school for central-station power engineers in industrial electric heating will be held in April, and detailed information will soon be available as to the time, place and curriculum. Executives interested in this intensive training for their sales engineers can obtain information from the chairman of any geographic power bureau of the N. E. L. A., from the chairman of the industrial heating committee, Wirt S. Scott, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., or from Mr. Tallman, care Charles H. Tenney & Company, 200 Devonshire Street, Boston.

Range Customers Provide 21.8 per Cent of Company's Revenue

Successful Promotion of Electric Cooking by a Central Station Which Sells and Serves Electric Ranges in a Small Town—Two-Rate Metering Used

THE electric range customers served by the Jefferson (Iowa) Electric Company in a town of 3,416 population provide a little more than one-fifth of its average monthly revenue. The accompanying tabulation of the typical average monthly kilowatt-hour output and revenue shows that the 119 residential customers using electric ranges pay the company a total of $944.76 for energy, which represents 21.8 per cent of the month's gross income. The average use of energy per customer of this class is 146 kw.-hr., earning a rate of 5.43 cents and producing an average bill of $7.93.

TYPICAL AVERAGE MONTHLY OUTPUT AND REVENUE

Class of Service	No. of Customers	Kw.-Hr. Used on Two-rate Meters	Kw.-Hr. Straight Meters	Total Kw.-Hr. Used	Amount of Total Bills	Per Cent of Total Revenue	Average Rate per Kw.-Hr. Cents	Average Kw.-Hr. Used	Average Revenue per Customer
Residence light	654	.....	14,773	.....	$1,508.84	34.8	10.2	22.6	$2.31
Residence range and light	119	11,412	.....	17,400	944.76	21.8	5.43	146.	7.93
Commercial two-rate	115	10,548	.....	18,000	871.47	20.0	4.84	156.5	7.56
Small miscellaneous customers	69	.....	1,061	.....	119.38	2.8	11.23	154	1.73
Two-rate meters on turning point	10	.....	937	.....	50.40	1.2	5.38	93.7	5.04
Three-phase power	32	.....	9,429	.....	406.59	9.4	4.32	295	12.75
Water heater	1	.....	3	.....	0.39	.....	.....	.....	.....
Coffee urns	3	.....	1,176	.....	39.39	0.9	3.35	392	13.13
Flat-rate lights	.....	.....	.....	132	5.10	0.1	3.86	.....	.....
City well pumps	.....	.....	3,440	.....	77.40	1.8	2.25	.....	.....
City triplex pump	.....	.....	.....	2,480	69.46	1.6	2.8	.....	.....
City street lights	.....	.....	.....	3,150	161.10	3.8	5.12	.....	.....
City five-light electroliers	.....	.....	.....	1,600	66.00	1.5	4.13	.....	.....
City one-light electroliers	.....	.....	.....	500	20.85	0.2	4.17	.....	.....
City traffic lights	.....	.....	.....	100	3.60	0.1	3.6	.....	.....
Totals	1,003	.....	30,819	43,362	$4,344.73	100.0	5.86	.....	$4.33
Estimated total kw.-hr. sold (30,819 + 43,362)									74,181
Estimated kw.-hr. for office and plant									500
Total kw.-hr. used									74,681
Switchboard output									87,624
Losses (14.8 per cent of total)									12,943

Average rate per kw.-hr. sold, 5.86 cents

Compared with this, 654 other residential customers using service for lighting only paid the company a total of $1,508.84, and while this represented 34.8 per cent of the total income, each customer used only 22.6 kw.-hr., for which he paid at the rate of 10.2 cents, and the average bill was only $2.31. Thus it is apparent that the use of an electric range adds $5.62 to the residential customer's bill, or, in other words, each range brings into the company $66.44 gross annual revenue.

The use of electric ranges in this town forms an interesting story of gradual development of this load by a small company which has resulted in the addition of profitable business and provided a very great convenience to its customers. This has been helped to a certain extent by the fact that there is no gas service in the town, but the principal elements influencing the use of electric ranges have been the excellent results obtained by customers, the company's liberal service policy and the sale of energy through a two-rate meter which permits the use of the service for cooking at approximately 5 cents per kilowatt-hour.

The company's first efforts to sell electric ranges were made in 1913, when a display and demonstration was put on at the county fair. At that time the town people were hoping to have a gas plant, but it did not materialize, and some of the people began installing electric ranges. The company made no special effort to sell them except that ranges were installed at cost subject to the customer's trial and approval. The company has always been very careful to see that installations were properly made and has tried to furnish complete repair service, standing back of the ranges even when it has sometimes cost money to do so.

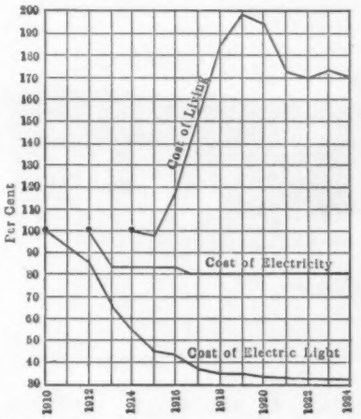
On all range installations a two-rate meter is used, which operates so that energy used during the peak lighting period in the evening is registered direct. But by means of a timing device during other hours of the day the meter registers only one-half of the energy passing through it, thus giving a 50 per cent discount from the rate used in figuring the bill. The company has experienced no trouble with this method of metering. There have been some complaints about the size of the two-rate meter bills but no lack of confidence in the meters themselves. There are customers on these meters who do not know but that they are paying straight 8 cents per kilowatt-hour, rather than an average of 5 cents per kilowatt-hour. The principal thing they care about is how much electric service they can get for their money.

A question sometimes arises as to when the range rate should apply and whether a one-burner or a two-burner hot plate should entitle a customer to the lower rate. So far the company has applied this rate in such cases. Moreover, a customer may have an electric range and use it very little, if at all, thereby securing the two-rate meter at greatly reduced rate for his other energy. The company appreciates this condition and is making a study to determine a method whereby all residences will have the same kind of meters regardless of the number and size of heating or cooking devices connected, excepting possibly water heaters. While this might involve some sacrifice in the residence lighting revenue temporarily, it is believed that the greater use of energy for other purposes would compensate for any losses.

This company's experience with electric cooking upsets some previous calculations as to the need for greatly increased capacity in meters, services, transformers and feeders. Some rearrangement of transformers and strengthening of secondaries has been done, but it has not been found necessary to rebuild any considerable sections of the distribution lines. Every range connected adds between 600 watts and 1,000 watts to the evening peak on the generating station, but in view of the revenue received per kilowatt it is considered a desirable and profitable load, which it has been possible to take on at a rate previously thought out of the question for residential customers in a town the size of Jefferson.

Cost of Electric Service Compared with Cost of Living

HOW reductions in electric rates have combined with improvements in the efficiency of incandescent lamps to reduce the cost of electric lighting during the period when the cost of living has greatly increased is graphically shown by the



DECREASES IN ELECTRIC RATES AND COST OF ELECTRIC LIGHT COMPARED WITH INCREASED COST OF LIVING

Consolidated Gas, Electric Light & Power Company of Baltimore.

The customer who used carbon lamps in 1910 and who now uses tungsten lamps at the lower rate has had a reduction of 75 per cent in cost for the same amount of light in 1924 from what it was in 1910, owing to the energy required being 31 per cent of what it formerly was and the rate being 80 per cent.

The chart shows the reductions in the cost of electric light compared with the increases in the cost of living, taking into account the gradual disappearance of the carbon and "Gem" lamps and allowing for the proportion of all lamps marketed in 1910. In view of the cost of living being 172.5 per cent (as reported for Baltimore by the United States Department of Labor) and the cost of electric light being only 32 per cent the lighting dollar has over five times the purchasing value of the commodity dollar.

In addition to the reduced cost of electricity and the improvement in the lamp, the price of the 50-watt tungsten lamp, which was $1.50, when the lamps were introduced in 1908, is now only 27 cents.

Learning from the Customer

NEW pathways to successful selling were blazed at a recent meeting of the Appliance Bureau of the New England Division, N. E. L. A., when three housewife customers of the Union Light & Power Company of Frankin, Mass., talked delightfully to an appreciative audience of electrical men and women on their personal reasons for purchasing electric ranges and their own home experiences in the cooking

field. There was nothing cut and dried about the meeting. None of the speakers quoted costs other than to point out that the saving in shrinkage when cooking by wire goes far toward justifying the installation of electric ranges. Each woman emphasized the immense gains in cleanliness, convenience, control, accuracy of production and comfort inseparable from intelligently handled electric cooking, and each unconsciously testified to admirable public relations with the central station by her manner and text of presentation. It was a red-letter day in New England electric appliance circles.

"Nothing succeeds like success," and this method of telling the electric appliance story gave even veteran salesmen and saleswomen present a fresh conception of the value of electric service in the home. More and more the service aspect of electrical applications is being stressed. Structural details of appliance design, cost of operation, terms of purchase and comparative features of competitive products no doubt belong in the total sales picture, but fundamentally electric service appeals as an aid to better living conditions with all its significance.

This is the crux of successful American mechandising, be it by the central station, the electrical or the non-electrical dealer. Candor forces the admission that the personnel of the electrical industry itself is still far from 100 per cent "sold" on the complete electric home in practice, and testimony of the kind developed at the Boston meeting is bound to open the eyes and minds even of long-experienced salespeople.

Utah Power & Light Opens New Sales Quarters

NEW merchandising quarters and Salt Lake City division offices have just been opened by the Utah Power & Light Company to provide facilities for its rapidly increasing business. The new electric store and offices have been laid out with a view to providing every convenience and comfort for the patrons of the company. Large space is afforded for displays of washing machines, ironers, vacuum cleaners, floor and table lamps, ranges and other domestic electrical appliances. Comfortable chairs are provided for the use of customers while making selections from the displays. An information desk is also provided for the convenience of persons desiring to visit either the general offices of the company on the upper floors of the building or for those making other inquiries regarding the company's service. A pleasantly appointed rest room is located on the balcony for women employees and customers. Convenient to the front door are the lamp counter and the office of the "fix-it shop," where customers obtain free repair service on appliances.

An auditorium has been arranged in the basement for demonstrations of electric cooking and other domestic applications of electricity, as well as display space for many appliances not shown on the main floor. Salesmen's quarters, the "fix-it shop," stockrooms and storage vaults are also contained in the basement. An interesting feature of the basement to the visitor, though not intended as such, is the display of the latest approved methods of inside wiring so as to meet the most rigid requirements of the fire underwriters' code.

NEW STORE AND OFFICES OF UTAH POWER & LIGHT COMPANY

Top — General sales floor, showing customers' counter in the rear.

Center — Small appliance display.

Bottom — Corner of lamp display.

In the show windows, consisting of an island window and large side and back windows, are shown the newest developments in window lighting, including the utilization of color applications for heightening the display values of merchandise as well as methods of using reflected and diffused white light. It is expected that the company's window lighting installation, while primarily designed to display its own merchandise advantageously, will be regarded as a demonstration of correct window lighting by merchants who are interested in improving their store lighting.

Ample space, attractive and well-appointed interior design and arrangement, embracing the most up-to-date features, make the Utah Power & Light Company's new store one of the finest in the West.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Electrically Driven Auxiliaries for Steam Generating Stations.—This is the serial report of the electrical apparatus committee which has been prepared under the auspices of the generating station sub-committee. The subject of electric drive resolves itself mainly into a consideration of the following factors: (a) The requirements of the various auxiliaries both as to speed range and the necessity for continuous operation; (b) the types of motors and control available for driving these auxiliaries, and (c) the methods of supplying electric power to these motors. These factors are covered in detail in this report, which is arranged in four sections. Section 1 presents the requirements of the various auxiliaries. These data were obtained from the heat-balance subcommittee of the prime movers committee. Tabulations and a discussion of the data are given. Section 2 contains a description of the types of motors and control available and was submitted by the manufacturers' representatives on the sub-committee. Section 3 outlines various sources of electric power for driving auxiliaries, including a discussion of their relative merits. Section 4 consists of data and diagrams indicating the methods used in driving auxiliaries in thirty-nine modern American steam generating stations. A bibliography is also included. The report is 132 pages long.—*Publication No. 24-34 of the N. E. L. A.*

New Type of Hydraulic Turbine.—Drawings, cuts and performance curves accompany the description of the propeller-type turbines installed in a station at Wynau, Switzerland.—*Engineer (England)*, Feb. 20, 1925.

Foundations for Turbo-Generator Sets.—O. DOHME.—The author gives in this paper from practical experience a large number of data which should help to supply missing information on this important subject. The data given are based on a 500 per cent safety factor for the loads. Graphic methods are used. The design and erection of foundations for large and important generators should be intrusted only to the most experienced men, and the builder of the set itself should not be expected to serve in this matter as more than a consulting engineer.—*Elektrotechnische Zeitschrift*, Feb. 19, 1925.

Long Beach Steam Station of the Southern California Edison Company.—W. D. CAMPBELL.—Construction and equipment details of the largest steam power station in the West are given. The capacity of the present installation is 70,000 kw., with an ultimate capacity of 140,000 kw. The station is designed to operate on either gas or fuel oil. Boilers will operate on 375-lb. pressure. Capacity of main generating units will be 35,000 kw. with 2,800-kw. auxiliary units direct-connected to the main units. An interesting feature is that this station was placed in operation eleven months from date of initial construction.—*National Engineer*, February, 1925.

Generation, Control, Switching and Protection

Automatic Stations and Supervisory Control.—L. B. CHUBBUCK.—One of the most interesting electrical developments in the last few years is the complete automatic operation of generating stations and substations and the distant control of such stations by supervisory control. At present there are more than 700 fully automatic stations, with a total capacity of equipment of over 600,000 kw., with units ranging in size up to 10,000 kva. One of the chief advantages of supervisory control is that it opens the way for development of thousands of small water powers, a problem that is discussed at length in the article.—*Electrical News*, Feb. 15, 1925.

Diesel Engine in Medium-Powered Central Stations.—R. C. BURRUS.—According to the author, the medium-size and smaller central stations operated by steam power waste nearly a ton of coal for every 125 lb. actually utilized. This is a ratio of waste to utilization of sixteen to one. He says that it is much more economical to use Diesel engines for power generation in these cases.—*Central Station*, January, 1925.

Induction-Regulator Plant.—J. KRISTEN.—For a tie-in between two cable feeders of 33 kv. and 6.6 kv. a special transformer and induction-regulator station was installed in Manchester, England, and is described in this short paper. So as to avoid phase displacement between the two feeders, which would be introduced by the customary type of induction regulator, double regulators were installed. These were combined from two single types, mechanically coupled and electrically driven by one motor. The machines have an internal capacity of 428 kva. each and give a buck or boost of plus or minus 5 per cent on the 6,600-volt side. This corresponds to a current of 750 amp. The regulators are oil-cooled in corrugated square sheet-iron tanks.—*Bulletin Oerlikon*, February, 1925.

Y-Point Grounding on Generators.—H. SCHULT.—Various opinions are held today on the following essential questions: (1) Should the Y-point of large three-phase generators be grounded or not? (2) If it is to be grounded, should it be dead-grounded or should a resistance be introduced into the ground connection? (3) What shall determine the size of such a resistance? The author investigates these questions and comes to the following conclusions: For an alternating voltage transmission of an inductive or a capacitive nature the grounding of the Y-point of a generator over a high resistance offers a safe protection. Even for a direct flashover between high and low voltage on the fed transformer the resistance ground does not permit a dangerous voltage rise on the generator winding, provided that no flashover against ground occurs at the same time. For the latter case a small resistance or dead grounding would be better. A puncture from high to low winding on a transformer as a consequence of a ground on the lines is very improbable, particularly if a Petersen coil is used, so that it appears to be safe to calculate the resistance from Y-point to ground from the permissible ground current or ground rest current. This will give adequate protection against inductive or capacitive voltage transmission, against transformer failure from high to low voltage winding and against stator ground.—*Elektrotechnische Zeitschrift*, Feb. 12, 1925.

Transmission, Substations and Distribution

High-Voltage Cables.—An abstract is given, with editorial comment, of a paper by Major A. M. Taylor on the hexaphase system and the compensated three-phase system for 150,000-volt transmission. The former consists of a system of cables with intersheaths, arranged on the principle of the condenser-type bushing, which are connected to intermediate taps on the transformer in such a way as to distribute the dielectric stress. The original proposal, made some years ago, involved six-cable transmission. The present plan contemplates the usual three-wire, three-phase arrangement, with single-conductor cables and provision for sending the charging current for the several sheaths through the central core.—*Engineer (England)*, Jan. 23, 1925.

Design of Oil Circuit Breakers.—P. CHARPENTIER.—The fact that American circuit breakers for 220 kv. were first made with an oil volume of 6,000 liters and that the same breakers were redesigned the following year for 20,000 liters, or 30 per cent more oil, is taken by the author as the best sign of how much uncertainty there is in the design of high-voltage circuit breakers. The author goes therefore into an elaborate and minute scrutiny of all the various constructive details which bear upon the design of this apparatus. He develops theories of the single and multiple break, describes the best-suited shapes of contacts, investigates the benefits of extinction chambers around the contacts, and attempts to calculate mathematically the required internal insulation of breakers in such a manner as to insure well-controlled electric stresses upon the insulating material used. A standard line of French breakers for 60 kv. to 150 kv. is finally described, for which exceptional advantages are claimed, such as high speed opening, small incumbrance and exceedingly small oil volume.—*Revue Générale de l'Electricité*, Jan. 17, 24 and 31, 1925.

Effect of Shielding Wires Upon the Interference Caused by Magnetic Induction.—T. MICHIDA.—Some tests have been conducted on the power transmission lines of the Tokyo Electric Light Company in order to determine the effect of shielding wires upon the magnetic induction caused in the

telephone and telegraph circuits. These results are described and compared with those derived from theoretical calculation.—*Journal of Institute of Electrical Engineers of Japan*, No. 437.

Units, Measurements and Instruments

High-Voltage Testing Transformer. K. FISCHER.—In the laboratories of a German university two high-voltage transformers of 250 kv. each have recently been installed. These give with their middle connection grounded a potential of half a million volts between the other two terminals. The machines are of the dry, air-insulated type and have an unusual high-voltage winding. There are six concentric cylinders around each of the two core legs, and on the surface of each cylinder is wound a single layer of fine enamel wire. The total length of the cylinders is tapered so that the distance of the winding ends toward the yokes increases as the voltage rises. The transformer requires a floor space of about 2 sq.m. and stands about 2 m. high. The thin wire of the high-voltage winding is normally stressed to about 4 amp. per square millimeter, whi h corresponds to a current of 80 milliamp. and an output of the transformer of only 20 kva. At full voltage only slight corona is visible at the ends of the windings.—*Elektrotechnische Zeitschrift*, Feb. 5, 1925.

Electric Thorsionmeter.—The instrument depends for its operation on the change in the secondary emf. of a transformer with a change in the length of an air gap in its magnetic circuit. A collar and a sleeve are fastened on the shaft to be tested, the points of attachment being separated by a distance about four times the diameter of the shaft. The displacement caused by the torsion in this length increases the voltage in one secondary and decreases that in another, connected in opposition. Instead of applying this voltage to an indicating instrument, it is bucked by a similarly induced voltage in a stationary transformer in which the gap has a hand-operated micrometer adjustment, which makes a null method that is independent of fluctuations in the primary supply. An interrupted direct current is used in the primary circuit. The mean torque is determined, with an accuracy, it is stated, of 0.5 per cent. Drawings and views accompany the description. — *Engineering (England)*, Feb. 13, 1925.

Illumination

Illumination and Lighting Equipment.—G. G. COUSINS.—In the design of an artificial lighting system one of the most perplexing features is to decide upon the intensity in foot-candles that will best serve the requirements of the problems in hand. The trend is toward ever-increasing intensities, and so far each increase in intensity for a given requirement has justified the extra first cost involved and has proved to be a profitable investment. In this article the author discusses the essentials of good lighting, common faults to be avoided, equipment and maintenance. — *Electrical News*, March 1, 1925.

Recent Developments in Electric Lighting.—W. E. BUSH.—The author of the paper presented before the Illuminating Engineering Society of England emphasizes the advantages of better illumination and explains the steps which the Electric Lamp Manufacturers' Association's lighting service bureau is taking to bring these advantages before the general public. He describes the organization of the lighting bureau and details the work it is doing.—*Illuminating Engineer (England)*, February, 1925.

Light and Vision.—This booklet presents in popular form some of the outstanding facts regarding illumination, facts well known to specialists but perhaps not to the general user of light. The topics are presented by pictures, curves and short verbal explanations and include speed of perception, discrimination, the astigmatic eye, tests showing the effects of intensity on speed of reading and on fatigue, effect of background, glare, illumination and production, school and home lighting.—*Nela Booklet G-1, National Lamp Works, General Electric Company.*

Heat Applications and Material Handling

Elements of Good Welding.—E. P. JESSOP. — The author discusses this subject under three phases—development of machinery for welding, the department of welding, which takes in the supervisory personnel, and lastly the operator. He points out that a perfectly good welder not properly instructed by the proper supervisory board may fail on a weld no matter how hard he may attempt to accomplish it, whereas if he had been informed as to what method to use to obviate the difficulties of the particular job in hand it would have been a simple matter for him to accomplish this work.—*Journal of the American Welding Society*, February, 1925.

Electrophysics, Electrochemistry and Batteries

Influence of Temperature Upon the Photo-Electric Effect.—J. RUD NIELSEN.—A discussion of Millikan's suggestion that the energy of the light is transferred to the free electrons of the metals as well as to the bound electrons. The variation of the long wavelength limit with temperature is investigated, and experimental results with aluminum and nickel targets are analyzed.—*Physical Review*, January, 1925.

Synthetic Lacquers and Insulating Compounds.—R. VAN MUYDEN.—After reviewing briefly the history of the synthetic lacquer industry in general, the author describes its gradual development in France and its noteworthy accomplishments there. Various manufacturing methods, starting with different raw materials, are described. Physical and chemical properties of these compounds are enumerated, with particular reference to their resistivity to water, oil and vibrations. A new, strictly French product, called "isolemail," is specially suited for electrical purposes, such as the impregnation of motor windings and transformer coils. A small motor, vacuum-impregnated with this new material, has operated continuously for several weeks partly submerged in water. The author calls attention to the advantages of this lacquer over the ordinary varnish treatment.—*Revue Générale de l'Electricité*, Jan. 31 and Feb. 7, 1925.

Telegraphy, Telephony, Radio and Signals

Marconi Marine Radio Direction Finder.—H. DE A. DONISTHORPE.—The device described makes use of the Bellini-Tosi principle—two stationary coils at right angles and a third movable coil which can be rotated in the field of the other two to the position of minimum or maximum response. The fixed coils are connected to antennas in corresponding planes. A method has been devised for determining the "sense" as well as "line" of direction of an incoming signal. Errors and their reduction or elimination are discussed, and instances are given of rescues effected through the use of the instrument.—*Proceedings of the Institute of Radio Engineers*, February, 1925.

Mobilizing for the Fight Against Sleet. — R. T. BARRETT. — The author describes the manner in which the Bell System organizes its forces for repairing damages from sleet storms. At present about 54 per cent of the Bell System total wire mileage is in cables, leaving 46 per cent in open wiring, the service on which may be very seriously hammered in case of storms.—*Bell Telephone Quarterly*, Vol. IV, No. 1.

Design of Telephone Transformers. —K. OKABE.—In discussing the design of telephone transformers involving complex permeability the author considers the various values of complex permeability obtained when the number of laminations and the number of exciting coils are varied. One section of the article is devoted to the experimental results that have been obtained. —*Journal of Institute of Electrical Engineers of Japan*, No. 437.

Miscellaneous

Electric Forces and Quanta.—Dr. J. H. Jeans' recent Kelvin lecture before the Institution of Electrical Engineers, here reported, is a résumé of modern theories which have modified or superseded those held by the earlier electrophysicists, these new theories having been developed to account for phenomena not explainable by the older views. Einstein's assumption of a four-dimensional time-space continuum to explain gravitational energy accounts also for electromagnetic phenomena and abolishes the luminiferous ether of Maxwell, Faraday and Kelvin. The change in the energy of the electron ensuing when it jumps from rotating in one orbit to rotating in another in the hydrogen atom accounts for all the lines in its spectrum. The publication of this address and that of Sir Oliver Lodge to the Radio Society (abstracted in the last issue of the ELECTRICAL WORLD) almost simultaneously affords an interesting comparison, especially as Sir Oliver uses Jeans' figures for computing the density of the ether, while Jeans himself denies its existence. — *Engineering (England)*, Feb. 13, 1925.

News of the Industry

No Long Carillon License

Ottawa Government Announces Inability to Grant Export Rights for More than Year

THAT the Canadian government could not, under present legislation, grant permission for the export of power at Carillon Falls on the Ottawa River for a period longer than twelve months was the answer given by the government on March 19 to a deputation of representatives of various interested municipalities. The Prime Minister declared that there might be a prospect later on of dealing satisfactorily with the matter; the government was, he said, carefully considering the case.

J. A. C. Ethier, member of Parliament for Two Mountains, Ontario, a contiguous district, explained that the project called for the development of 410,000 hp. at Carillon Falls, 300,000 hp. of which would be exported to the United States and the rest retained for home consumption. J. A. Fortier, member of Parliament for Labelle, Quebec, on the other side of the Ottawa River, emphasized that the people of Labelle County were strongly in favor of the development. Alderman D. D. Lowe of Ottawa drew attention to the fact that the Ottawa City Council had passed a resolution favoring it.

George P. Graham, Minister of Railways and Canals, pointed out to the deputation that a sub-committee of the Cabinet had been endeavoring to arrive at a solution of the question. It was at first believed that it would be possible to grant a lease on a yearly basis, but the investors, who proposed placing a large amount of money behind the scheme, had declined to go ahead on this basis. The Provinces of Ontario and Quebec had also voiced their objections to permission being given for the export of power to the United States. An amendment to the law would be necessary, and a bill of this nature would hardly stand much chance of success in Parliament, in view of the objections put forward by the two provinces concerned.

Ottawa Government Puts Tax on Exported Electricity

The budget proposals of the Canadian government as announced in the House of Commons at Ottawa on Tuesday, March 24, include an export duty on electrical energy of 0.03 cent per kilowatt-hour, payable from April 1 next. This rate, already approved by an order in Council, is equal to $1.95 per horsepower-year. No tariff tax has ever been imposed previously on electricity exported from Canada.

The power now exported from Canada to the United States may be roughly estimated at 1,300,000,000 kw.-hr. a year, the duty on which at the above rate would reach $390,000. On a total estimate of 3,000,000,000 kw.-hr. as the amount of energy that American industry could yearly absorb from the Dominion at this time, were it available, the duty would be $900,000.

California Bill for Taxing Public Utility Plants

As already published, taxation of publicly owned utilities is proposed in a bill now pending before the State Legislature of California. Under this measure municipal and other publicly owned utilities would be required to pay a tax of 7½ per cent of their gross revenue the same as is now required of privately owned utilities. The bill has been reported out of committee, but no action has been taken by either house. Being a constitutional amendment, the act, if passed by the Legislature, will require ratification by the people at next year's general election.

The bill is being sponsored by the Farm Bureau on the ground that the farmer is being unjustly taxed for state government by the failure of municipal utilities and irrigation districts to pay any state or other taxes. Considerable opposition has been organized by Los Angeles, San Francisco and other cities. An initiative measure of the same tenor was rejected at the polls in 1922.

Supreme Court Ruling and General Electric Probe

Publication of a statement that the Federal Trade Commission may not attempt to investigate the General Electric Company as a result of the Supreme Court's decision in the Baltimore grain cases, which held the commission to be without authority to seize or search the books of a private corporation in the conduct of a general investigation, brought from the commission on March 25 a pronouncement to the effect that no action has been taken to halt the investigation, which already is under way. No comment was forthcoming, however, as to the possible effect of the Supreme Court's ruling on the conduct of the probe into the affairs of the General Electric Company. It is understood that there will be no occasion for the commission to suspend its investigation because of doubt as to its authority to pursue it. The General Electric Company, it is said, will raise no questions as to its rights and will furnish the commission voluntarily with any information necessary to a full and fair investigation.

Such attention as is being given at this time by the commission to the investigation of the General Electric Company is being concentrated on a review of existing literature dealing with the matter. No questionnaires have been sent out as yet and no plans for the gathering of information have been formulated.

Arizona's New Plan

Would Divide the Waters of the Lower Colorado Basin with California After Supplying Nevada

THE resolution introduced, as previously reported, in the Arizona State Legislature to authorize the ratification of the seven-state Colorado River treaty, provided that Arizona, California and Nevada enter into a supplementary agreement between themselves and with the Congress of the United States regarding the apportionment of the waters in the lower basin of the river, has been passed. The resolution sets up a Lower Division Colorado River Commission to act for Arizona in the negotiations. By the prescribed agreement Nevada would have "all of the water which can reasonably be applied within said state to domestic and agricultural uses" and California and Arizona would share equally in the remainder. Other provisions are these:

"The right given to the lower basin by paragraph B, Article III, of the Colorado River compact to increase its beneficial consumptive use of the waters of the Colorado River system by one million acre-feet per annum shall attach, relate and belong exclusively to the State of Arizona; provided, that said right shall attach solely to and shall be held to completely exhaust the right to the use of waters of the Colorado River system entering the Colorado River within the State of Arizona below Lee Ferry. Any waters which it may hereafter become necessary, under the provisions of paragraph C, Article III, of the compact to deliver to the United States of Mexico shall be supplied, first, out of the surplus waters of the main Colorado River passing Lee Ferry, over and above the apportionment to the lower basin contained in paragraph A, Article III; and if said surplus shall prove insufficient, then the burden of deficiency resting upon the lower basin shall be borne by the States of Arizona, California and Nevada exclusively out of the apportionment provided in paragraph A, Article III, in the proportion that the respective diversion by such states out of the Colorado River of the waters so apportioned by paragraph A, Article III, may bear to said apportionment."

Muscle Shoals Commission May Be Named at Once

The President intends to announce promptly the names of the members of the Muscle Shoals commission, it was stated at the White House this week, and they may be made public before this issue of the ELECTRICAL WORLD reaches its subscribers. Consideration is being given to the advisability of including certain members of the Cabinet in the commission's membership.

Consideration also is being given to the proposal that the commission consist of five or more members.

As this is written, it is believed that Dr. F. G. Cottrell, the director of the government's fixed-nitrogen laboratory, will be a member of the commission. It also is known that the President is considering carefully the name of William McClellan, a consulting electrical engineer of New York and former president of the American Institute of Electrical Engineers.

Conowingo Contest Is Being Heard by "Tri-Commission"

No new developments of importance in the struggle over the Conowingo project of the Susquehanna Power Company had been reported up to the time the ELECTRICAL WORLD went to press, but those interested were concentrating their attention on the meeting of the Pennsylvania Public Service Commission in Philadelphia, on Friday, which was to be participated in by the members of the Maryland Public Service Commission, by O. C. Merrill, executive secretary of the Federal Power Commission, and by representatives of the government of Maryland.

The Philadelphia Rapid Transit Company, antagonizing the project on the score of excessive profits to bankers and contractors and claiming that it will cost twice the estimated price of $52,000,000, was to prepare questions to be submitted to the Philadelphia Electric Company, and on the answers the action to be taken by the Pennsylvania commission was to depend. Engineers of the Susquehanna Power Company assert that a few days' delay after the first of the month will prevent immediate development of the project. In view of this it is thought that if the Pennsylvania hearing is finished this week the three commissions will confer immediately and act concurrently on the project within a short time.

Maryland's demands that state property and state interests be protected will be pressed by the Maryland commission representatives at the conference of the so-called "tri-commission." The issuance of a federal license awaits action by the two states, and the matter seems to hinge on the outcome of the fight between two groups of powerful financiers.

Superior, Wis., Finally Gives Up Public Ownership Plan

After seven years of negotiation and litigation the City Commission of Superior, Wis., has at last unanimously voted to abandon its attempts to acquire and operate the properties of the Superior Water, Light & Power Company, thus sounding the death knell of municipal ownership of public utilities in the city. After the company won its case last year before the United States Supreme Court, which declared illegal the city's attempt to acquire the properties by condemnation proceedings, the city authorities declared their intention to begin the municipal ownership movement all over again. The present action of the City Commission, however, terminates the municipal ownership fight.

No Hydro Act in New York

Legislature Comes to an End Without Enactng Any Law to Develop Water Power

AS WAS anticipated, the New York State Legislature, scheduled to end its sessions with the expiration of this week, has not adopted any general measure governing the development of water power in the state. Governor Smith took occasion in the closing days of the Legislature to send a message reiterating his plea for a New York State Power Authority and asking for the abolition of the Water Power Commission and Water Control Commission, but the Republican Legislature would have none of it.

"It seems a great pity," the Governor said, "that nothing can be done to take advantage of our great natural water-power resources. It is a sad commentary on our intelligence to think that we allow months and years to slip by, dragging millions of tons of coal into the state, while vast water powers are running to waste capable of generating power sufficient to heat, light and operate the homes, mills and factories of the state. . . . If you are unwilling to write the principle of state ownership and control of the basic resources into the law setting up the Power Authority, then pass a bill that will abolish the commissions now empowered by law to alienate these resources for a long period of years or permanently and permit the determination of these questions to be a part of the plan set up by the Power Authority. If this is done, no objection can then be offered to the bill in the form in which it passed the Assembly last year."

The Wales-Hutchinson bill, entitled "An act to authorize the Water Power Commission of the state to negotiate with other states, the District of Columbia and Canadian provinces compacts under the constitution of the United States for action by the Legislature for the regulation of interstate and foreign transmission and delivery of electric current," was reported out of committee and placed on the respective calendars of the two houses and was expected to pass, though it had not been adopted up to Wednesday night. This measure was introduced in furtherance of the hydro-electric development program of Governor Pinchot of Pennsylvania and concerns the intrastate regulation of a superpower development between the Canadian provinces and the eastern border states. If enacted by all the states affected, it would form a basis not only for regulation of interstate development of state-owned power, but for the interstate development of a privately owned super-hydro-electric system.

Minnesota Against Public Exploitation of Power

By a vote of seventy to fifty-seven the House of Representatives of the Minnesota Legislature has killed the Stockwell water-power bill. The measure embodied a proposed constitutional amendment to permit the state to acquire water-power plants or sites and operate hydro-electric plants to sell electricity to communities or industrial companies. It provided that the state could issue up to $50,000,000 in bonds for this project. The House appropriations committee recommended the measure to be indefinitely postponed. The author of the measure asked the House to keep the bill alive for further discussion, but the committee report was sustained.

John Fritz Medal Awarded to J. F. Stevens

Together with the other three founder societies, the American Institute of Electrical Engineers took part on Monday evening, March 23, in the presentation at the Engineering Societies Building, New York, of the John Fritz gold medal to John Frank Stevens, whose services in discovering the Marias Pass across the Rocky Mountains and building the Cascade Tunnel for the Great Northern Railway, of which he became chief engineer and general manager; as chief engineer from 1905 to 1907 of the Panama Canal, and as a railway expert in Russia, Japan and Manchuria for six years during and after the war, were cited among other reasons for bestowing upon him the coveted honor.

The chairman of the meeting was John R. Freeman, past-president of both the A. S. C. E., of which Mr. Stevens is an honorary member, and the A. S. M. E., and the medal was presented by Charles F. Rand, past-president A. I. M. E. Ralph Budd, president Great Northern Railway Company, and Roland S. Morris, former United States Ambassador to Japan, made addresses in praise of Mr. Stevens. Mr. Rand was the chairman of the board which made the award, on which the A. I. E. E. was represented by A. W. Berresford, William McClellan, Frank B. Jewett and Harris J. Ryan, all past-presidents.

Large Interest in New York State Properties May Pass

Negotiations for the sale of large blocks of stock held by the Anthony N. Brady estate in four utility properties in the "capital district" of New York State are reported to be under way. The purchaser mentioned is the Power Corporation of New York, which, through its subsidiary the Northern New York Utilities, now plays a prominent part in the upstate light and power field. The four companies concerned are the Utica Gas & Electric Company, the Cohoes Power & Light Corporation—both under the presidency of Frank M. Tait of Dayton, Ohio—the Municipal Gas Company of Albany and the Troy Gas Company, the two last named having electric departments. The combined assets of these companies are put at about $50,000,000 and their gross annual earnings at more than $10,000,000. It is not asserted that the purchase of the Brady stock would carry with it control of the properties named, nor is there any reason to assume that the Brady utility interests in Greater New York City and elsewhere would be affected by the deal should it take place.

Tornado Spares Transmission Lines

Comparatively Small Damage to Electric Systems in Storm-Swept Zone of Illinois and Indiana—Local Distribution Plants Are, However, Hard Hit

DESPITE the terrible loss of life and property in the tornado-stricken districts of southern Illinois and western Indiana, reports from the utilities operating in these territories indicate relatively small damage to electric service properties. Many representatives of utility companies attending the convention of the Illinois Utilities Association in Chicago left hurriedly to return to their stations in the stricken districts. Of the towns which suffered the worst casualties, West Frankfort and De Soto, Ill., and Griffin and Princeton, Ind., are served by the Central Illinois Public Service Company, controlled by the Middle West Utilities Company; Murphysboro, Ill., by the Western United Corporation, and Duquoin, Ill., by the Illinois Power & Light Corporation. Other towns in which casualties were heavy in proportion to the population are served by municipal plants which have not yet reported.

Though the towns which suffered the greatest loss of life were on the Middle West system and though the path of the tornado was along and across an extensive network of interconnected transmission lines, that company reports only 6 miles of 33,000-volt transmission and six steel towers down as a result of the storm. Very fortunately, the Grand Tower (Ill.) generating station and the West Frankfort 66,000-volt switching station escaped any damage. All local distribution in De Soto and fifteen square blocks of distribution in West Frankfort were destroyed, but these sections themselves were wiped out so that restoration of service, while made with speed, was not of vital urgency. Everywhere in the devastated towns the electric light and power companies showed their public spirit by prompt restoration of service and the extension of help of every kind within their power. In West Frankfort, for instance, where it will take a month to restore gas service, electric lights were burning two days after the disaster.

The new electric power plant of the Western United Gas & Electric Company just completed at Murphysboro was partly wrecked. The walls and roof of the plant were blown down in the storm and the equipment somewhat damaged. The Western United loss was comparatively light in the district, W. M. Willett, general manager of the company, reported. Light was immediately furnished in those sections of the community where lines were still up. Every available repairman in the southern part of the state was rushed into the district to begin repair, and temporary service was given as rapidly and as extensively as possible.

PATH OF THE TORNADO IN MISSOURI, ILLINOIS AND INDIANA

DESTRUCTION AT PRINCETON, IND.

A typical example of the effects of the storm is contained in the experience at Princeton, Ind., with more than seven thousand inhabitants. The tornado devastated the southern half of this town, completely wrecking a portion of the Consumers Power Company's 33,000-volt double-circuit transmission line and its distribution system. This company lost about 200 poles. The Southern Indiana Gas & Electric Company's 33,000-volt transmission line supplying that company's interurban railway into Princeton was completely wrecked for more than a mile, and it will probably be several weeks before the traction line is again in operation between that point and Evansville, Ind.

Although the Southern Railway Company's division shops at Princeton were almost totally destroyed, the Consumers Power Company's substation serving the town was virtually untouched, it having been built behind a hill. The Heintz Company's catsup plant, served by this company, was demolished, it being in the direct path of the twister.

Estimated damage to the Consumers Power Company's property in Princeton is about $50,000, while that to the Southern Indiana company will amount to many thousand dollars. The Consumers Power Company, being harder hit by the storm than the other utility, immediately set to work shipping material, men and tools from its Vincennes storeroom into the affected district. Orders were placed for large quantities of line material through the offices of its parent company, the Interstate Public Service Company at Indianapolis. Deliveries of this material were prompt, and as a result considerable progress was made toward rebuilding of the main transmission line by the end of the week.

In the meantime only the storm-swept portion of Princeton was out of service, the company's steam reserve plant at that point having picked up the town's load. However, Owensville, Cynthiana and Poseyville, Ind., re-

VIEWS OF ELECTRIC TRANSMISSION LINES WRECKED BY TORNADO AT PRINCETON, IND.

Left—Looking south along interurban line—Southern Indiana company's 33,000-volt line on right and Consumers' Power double-circuit 33,000-volt line on left.

Right—Looking east at crossing of 33,000-volt lines of Consumers Power Company and Southern Indiana Gas & Electric Company.

mained without light or power for several days, owing to the destruction not only of parts of the distribution line reaching them but of part of the main transmission line as well. Service over both lines was, however, speedily restored.

The distribution system in the affected district is to be rebuilt immediately, the street lighting to come first. So completely wrecked are the majority of residences that in all probability the distribution system will be in service long before most of the houses have been rebuilt and ready for connection. All of the Consumers Power Company's line gangs as well as those of the Indiana Power Company and such as could be spared from the Interstate Public Service Company are at work in Princeton.

In Missouri, according to a dispatch from J. B. Sheridan of the Missouri Committee on Public Utility Information, damage to village and industrial electric properties from the cyclone will not exceed $2,500.

Oklahoma Association Sets Up Public Relations Division

As intimated in the ELECTRICAL WORLD for March 14 (page 576), the convention of the Oklahoma Utilities Association held in Oklahoma City on March 10-12 resulted in the creation of a new division of that body, to be known as the Public Relations Division. This division was the direct outgrowth of a public relations luncheon held at the Oklahoma Club and attended by officers of the association, executives of several companies and several public relations directors from Oklahoma, Texas and Kansas. The creation of this division will place the public relations men on the same basis in the association as the company executives belonging to the other five divisions. They will have equal representation on the board of directors with the electric light, electric railway, gas, telephone and manufacturers and suppliers' divisions.

The new Public Relations Division will hold meetings at least quarterly, at the call of the chairman, for the purpose of outlining methods of conducting public relations work in a more systematic and effective manner and insuring closer co-operation between the company executives and the public relations departments in this important work. The following were chosen to represent the division on the executive board: Chairman, George A. Davis, assistant to vice-president in charge of public relations, Oklahoma Gas & Electric Company; Keith Clevenger, Harvey E. Rhodes and H. B. Cobban.

The Oklahoma Utilities Association chose the following officers for the coming year: President, R. C. Sharp of Tulsa, vice-president of the Oklahoma Natural Gas Company; first vice-president, H. B. Cobban, Miami, general manager Northeast Oklahoma Railroad Company; second vice-president, F. B. Hathaway, Oklahoma City, manager General Electric Company; treasurer, W. R. Emerson, Oklahoma City, secretary-treasurer Oklahoma Gas & Electric Company; manager, E. F. McKay, Oklahoma City. James H. Buell, Tulsa, vice-president Oklahoma Power Company, was made chairman of the Electric Light Division of the association, and G. W. Skow, general manager Southwest Power Company, will represent that division on the executive board. F. T. Ealand, Oklahoma City, manager Southwest General Electric Company, will be chairman and board representative for the Manufacturers and Suppliers' Division.

Illinois' Record-Breaking Convention

Problems in Small Communities, Harmonizing Relations at Home, Budget Making, Interconnection, Operation and Rural Service Furnish Main Topics

SEVERAL papers and discussions worthy of a national convention and other papers of much local interest were presented in the two-day convention of the Illinois Utility Association in Chicago on March 18 and 19. More than a thousand persons attended the convention, the largest attendance on record. Group luncheons were a feature.

Besides the topics of interest to all utility companies, the men of the Electric Section discussed their own problems in separate meetings. These topics took a wide range.

Speaking before the banquet on Wednesday evening, Martin J. Insull, president of the Middle West Utilities Company; William A. Baehr, vice-president and general manager of the Illinois Power & Light Corporation, and John F. Gilchrist, vice-president of the Commonwealth Edison Company, championed a code of utility management founded on the broadest interpretation of service and individual responsibility. Mr. Insull said that popular prejudice and suspicion engendered in early days, however persistent, can be obliterated by frankness and square dealing. Mr. Baehr emphasized the increasing responsibility which rests upon each individual in the utility business, especially where large groups of properties are concentrated. Mr. Gilchrist pointed out the danger of going ahead too fast in power development, when capital seems easy to get, without visualizing the future.

MANY TOPICS DISCUSSED

Dealing with small-town problems before the regular sesion on Wednesday, Allen T. Early, district manager Illinois Power & Light Corporation, Collinsville, said that the greatest benefits cannot come to a company and serious troubles may result if a centralized management or holding company limits the authority of the local managers too much.

Striking differences between electric service in small communities and in larger cities were brought out by Cale R. Gough, president of the Albion Electric Company, who emphasized the fact that many opportunities for sale in large cities are not open in small communities because of the lower average income.

R. D. Hart, Central Illinois Light Company, Peoria, Ill., related experiences which indicated that the average income is not so small in all communities, that sub-letting wiring contracts to contractors under supervision and on a time-payment basis has been found effective in small communities, and that more range load can be secured per capita in some small cities than in the larger ones. In small communities, he pointed out, street-lighting load is the cheapest police protection. J. C. Martin, Middle West Utilities Company, told of a town of only 500 population there are forty-eight ranges and seventy-two hotplates. In general, he pointed out that the houses which can afford electric ranges are together, so the distribution expense is not as much as would be expected.

"Selling" the company to employees was emphasized by several speakers as the first step toward good public relations. Paul Herring, People's Gas Light & Coke Company, Chicago, cited various means of doing this.

John F. Gilchrist, Commonwealth Edison Company, pointed out that the opportunity for personal contact between the public and executives in large organizations is limited so that the problem of "selling" the company to the employees who meet the public is a still more important task than in small companies. It is also a bigger one. This educational work must be directed at the employees who are younger in service. They constitute possibly 80 per cent of the company, and among them the turnover may be 100 per cent or higher.

D. W. Snyder said that irritating incidents in public service seldom come to the attention of the executives, but they do reach the employees and their families. Employees should not only allay irritation but should also be encouraged to repeat the complaints of customers to executives.

The belief was expressed by B. J. Mullaney, vice-president People's Gas Light & Coke Company, that courteous treatment can be taught by a "case" method similar to that used in law.

An excellent address was made by Dean Heilman of Northwestern University on why special utility courses are needed in universities. This subject was also discussed by Dr. A. E. Patton of the University of Illinois. F. N. Leonard, Public Service Company of Northern Illinois, said that his company is delighted with the experience it has had with the graduates. John H. Mitchell, general manager East St. Louis Light & Power Company, presented a comprehensive report on available material and methods for educating employees and told of successful methods of application.

BUDGET, INTERCONNECTION, OPERATION

Money is made available to the engineer when it has the opportunity of earning dividends, and it is the engineer's responsibility that this earning power be not impaired by the manner

of use, declared R. F. Schuchardt, Commonwealth Edison Company, in discussing the engineer and the budget. The engineer has an important part in the preparation of the budget even if he has to accept substantial modifications. These modifications should not discourage engineers, but should serve as a challenge to their resourcefulness. Engineers will recognize in the budget a plan which, while somewhat more flexible and approximate, is as important to the financial operation of the company as blueprints are in erecting physical structures. The engineer must therefore present his requirements with sufficient clearness and force to give the financier a proper understanding of the relative importance of his recommendations. Mr. Schuchardt said that if engineers are thought to be only technicians and if the opportunity for development along commercial lines is denied them, the balance sheet is sure to reflect decreased efficiency and lowered enthusiasm.

Somewhat related subjects were discussed by J. Paul Clayton, vice-president Central Illinois Public Service Company; Julius Hecht, vice-president Public Service Company of Northern Illinois, and H. C. Heaton, Sargent & Lundy. Discussing interconnection in Illinois, Mr. Clayton pointed out that the state has 7,000 miles of transmission lines serving 1,200 communities and before long will serve almost every community. Interconnection is not spectacular, he admitted, but is typical of what should come in any territory that develops.

J. C. Martin discussed at some length economic problems of interconnection, and Allen M. Perry, ELECTRICAL WORLD, pointed out that one impediment to more interconnections lies in the difficulty that parties to a proposed interconnection find in agreeing upon financing methods and contractual relations.

Discussing development in the operation of electric transmission systems, Mr. Hecht went into detail regarding the advantages of interconnection, citing specific figures. He commented on the advisability of ground wires and lightning arresters and touched on the use of phase separation and ironclad switchgear, the necessity of selective relay action on interconnections and loop systems, the importance and requirements of a system load dispatcher, results of live-line insulator tests, regular patrolling of lines, working on energized line, sectionalizing of lines, etc.

E. F. Kelly, Central Illinois Public Service Company, declared that his company has shut down ninety isolated plants in very small communities, with a net saving of $50,000 per month by the substitution of an interconnected system. B. G. Jamieson called attention to the fact that the major generating stations built since 1921 have used isolated-phase construction. Ironclad switchgear, if used with such construction and single-conductor cable, can overcome many of the past operating troubles, he maintained. Owing to the possibility of neglecting phase-to-phase clearances by the use of isolated-phase construction, 25 to 30 per cent saving in space can be effected.

The trend of developments in central stations was outlined by Mr. Heaton, who concentrated his attention chiefly on prime movers, interstage superheating, boilers, fuel economizers, air preheating, stokers and furnaces, powdered-fuel combustion, automatic control, feed-water treatment and heating, coal-handling equipment and electrical distribution.

RURAL SERVICE PROGRESS

Considering the national movement under way in fifteen states to ascertain whether rural service applications can be developed sufficiently to interest utilities in supplying service at rates attractive to farmers, Dr. E. A. White, chairman of the national committee, suggested a simple rate structure which would embody a high initial cost and a low energy cost and would encourage volume consumption. Every item of this rate should be justifiable on the cost-of-service basis.

A. J. Luick, Illinois Power & Light Corporation, emphatically agreed that rural service is a problem that must be faced and not dodged. His company has filed rates with the commission for rural service on the same lines as urban rates but having an excess-cost charge to allow for the initial investment and fixed and operating charges.

Municipal Plants in Illinois Cut Small Figure

That Illinois possesses what are "probably the greatest electric light and power facilities per capita of any state in the Union" and that the total horsepower of all electric light and power plants operated by Illinois municipalities, even when the capacity of the Chicago Sanitary District and park boards' plants is included, is only a few hundred horsepower in excess of the capacity of any one of three recently installed generating units of the Commonwealth Edison Company, are two of the statements of fact contained in a pamphlet on "The Electricity Supply of Illinois," just issued by the Illinois Committee on Public Utility Information.

The publication gives a list of 108 discontinued municipal plants or electric businesses. One or more such businesses still exist in thirty-nine counties, but among the seventy most populous cities of the state Peru is the only one which provides the entire electric facilities for the community and Springfield is the only one possessing generating capacity above 1,800 kw. Springfield's 10,225 kw. makes up a large part of the municipal total, which, excluding the Chicago plants referred to and cities generating electricity only for street lighting, is 25,921 kw., as against the private-company total of 1,737,715 kw., which in its turn excludes plants that generate electricity wholly for electric railways.

Power Company and Irrigation District to Build Plant

A power plant to cost $1,500,000 is to be built by the Pacific Gas & Electric Company under an agreement just entered into between that company as lessee of the San Francisco & Sierra Power Company and the Oakdale and South San Joaquin Irrigation District. Under the terms of a forty-year contract the irrigation district is to build an impounding dam and the power company will build, own and operate a 35,000-kva. power plant below the dam, which will be on the Stanislaus River in central California. The power company will pay about $5,000,000 for the water used over the forty-year period and will have the right to 100,000 acre-feet of water annually plus the normal flow of the river over and above the storage capacity of the reservoir. Work on the project awaits the approval of a bond issue by the dwellers in the irrigation district, and an election is to be called at an early date.

N. F. P. A. Appoints Field Man for Electrical Effort

Arrangements have been completed with W. J. Canada to act as electrical field secretary of the National Fire Protection Association. Mr. Canada will act under a regular committee of the N. F. P. A. to be called the committee on electrical field service, composed of representatives of member organizations joining in support of this activity. These organizations are the Association of Electragists International, the Electrical Manufacturers' Council, the Electrical Supply Jobbers' Association, the National Board of Fire Underwriters, the National Electric Light Association and the Underwriters' Laboratories. It will be Mr. Canada's especial function to further the correlation of all efforts toward unification of electrical practice—particularly through the medium of more widespread recognition and understanding of the National Electrical Code as an American standard. Mr. Canada relinquishes charge of the engineering department of the National Electric Light Association to undertake this new co-operative activity, beginning May 1.

Bruce Barton Talks to New York Electrical League

Three things industry must do if it is to be proof against popular misunderstanding and attack, according to Bruce Barton, the well-known editorial writer, novelist and electrical advertising man, who spoke before the New York Electrical League on Wednesday. It must clean house wherever corruption or selfishness exists and keep a clean slate; it must zealously guard its honor and its running reputation against misrepresentation, and it must frankly and continuously tell its story to the people, interpreting in detail its principles, its policies and its performances as well as its product. The electrical industry he holds especially fortunate because the broad popular appeal of the services it renders to mankind makes the maintenance of good public relations a simple matter if these three measures are taken.

More than five hundred electrical men and women attended this luncheon of the league. The program was in charge of a special committee of the press, of which Earl E. Whitehorne, commercial editor of the ELECTRICAL WORLD, was chairman.

Federal Board Activities

Many Permits Issued and Applied For—Gauley River Development Approved—Alaska Project

PRELIMINARY permits have been issued by the Federal Power Commission as follows:

For the Gauley Power Company of Charleston, W. Va., covering a proposed project on Gauley and Meadow Rivers. The development involves six dams in the Gauley and four in the Meadow River. In addition storage dams in the tributaries of Gauley River are contemplated. It is proposed to install 55,000 hp.

For the El Dorado Power Company of San Francisco, covering a proposed project at China Flats on the Silver Fork of the South Fork of American River in El Dorado County. Ultimately some 7,000 hp. can be developed at the site, it is estimated.

For the Kentucky Hydro-Electric Company of Louisville, covering proposed developments at Locks No. 1 to No. 7 inclusive on the Kentucky River.

For the Southern Colorado Power Company of Pueblo, covering a development on Grape Creek, a tributary of the Arkansas River. Two reservoirs are to be created which will permit the development of 13,500 hp.

For the Interstate Public Service Company of Indianapolis, covering a proposed project on the St. Joseph River. It is proposed to install 4,200 hp.

An agreement has been reached between the Federal Power Commission and the Western States Gas & Electric Company whereby $1,898,365 is to be regarded as the fair value of its Placerville plant on the South Fork of the American River in El Dorado County, Cal. Similar agreements have been entered into with the San Joaquin Light & Power Corporation. The fair value of its Kerckhoff plant on the San Joaquin River is fixed at $6,166,206, while $2,097,230 is agreed upon as the fixed capital account of the project as of December 31, 1922.

Applications Before Board

The Washington Water Power Company has applied for a license covering transmission lines from its Long Lake power house to its substations at Stratford and Brewster. The aggregate length of the lines is 162 miles. The Southern Sierras Power Company has applied for a license covering a transmission line in the Yuma Indian Reservation. The Red River Lumber Company, Minneapolis, has applied for a license covering a transmission line and supplementary telephone line extending from Hat Creek power house No. 1 of the Pacific Coast Electric Company to the town of Westwood, approximately 55.6 miles long, in Lassen and Shasta Counties, Lassen National Forest.

The Missouri Hydro-Electric Power Company, Kansas City, has applied for a permit covering a public utility development in Current River, in Ripley, Carter and Shannon Counties, Mo., to include three dams, 60 ft., 75 ft. and 200 ft. high respectively, at Hargus Eddy, Bass Rock and a point approximately 10 miles below the mouth of Jack's Fork.

Thebo, Starr & Anderton, Inc., San Francisco, have applied for a permit for a public utility installation about 35 miles southeast of Juneau, within the Tongass National Forest, Alaska. on Long Creek or River, Crater and Sweetheart Creeks and Speel River, to have an installed capacity of approximately 104,500 hp.

The Northwestern Power & Light company has applied for a preliminary permit covering power development in Glines Canyon on the Elwha River. Preliminary permits have also been asked for by the Snow Storm Silver Lead Company for a small project on Callahan Creek in Washington and by W. W. Cunningham for a small project on Thompson Creek in Mona County.

Hydro-Electric Projects on the Pacific Coast

Three water-power projects of moderate size are seeking authorization from the state authorities in the State of Washington. R. F. Brown, Centralia, has filed application for 250 sec.-ft. from the Cispus River, in Skamania County, for development of a 20,000-hp. plant to cost $1,500,000. The dam will be 100 ft. high and 400 ft. long, and the power will be used for both industrial and domestic purposes. A 12,600-hp. plant on the Toutle River, a tributary of the Cowlitz, in Cowlitz County, is projected by Dr. Henry W. Coe of Portland, who applies for 225 sec.-ft., and will spend $1,100,000. The Northwestern Power & Light Company of Port Angeles has asked for 500 sec.-ft. of the Elwha River in Clallam County to develop 7,500 hp. at a cost of $800,000. A dam 160 ft. high and 400 ft. long will be erected.

Patent Office Goes to Commerce Department

On Thursday, March 19, President Coolidge issued an executive order transferring the United States Patent Office from the jurisdiction of the Department of the Interior to the Department of Commerce, thereby placing it under the control of Secretary Hoover.

The action taken marked the first shifting of a government agency intact, in accordance with the departmental reorganization plan which has been recommended by both Cabinet officers involved and by the Congressional committee on reorganization. It was explained that this was one of the few instances in which the President has legal authority to transfer an agency from one department to another. Virtually all the other departmental changes recommended in the reorganization plan require legislative sanction.

The Department of Commerce organization act vests the President with authority to transfer certain bureaus whose work is related to commerce to that department, and it was under such authority that the executive order was issued. In announcing the change Secretary Hoover declared that he intended to undertake a vigorous campaign for the removal of present injustices toward American patentees and American manufacturers.

Briefer News

New Mexico Convention Tentatively Set for April 20-22. — The dates of April 20, 21 and 22 have been tentatively set for the holding of the New Mexico Electrical Association convention at Albuquerque, which was postponed on account of important matters confronting the principal central-station companies at the time. Arthur Prager, general manager of the Albuquerque Gas & Electric Company, is in charge of arrangements for the convention.

Hydro-Electric Plant Projected on Central Lakes of New York.—From Sodus, N. Y., announcement is made of a projected hydro-electric plant promoted by the Lamoka Electric Power Corporation, to generate from 25,000 hp. to 40,000 hp. and cost about $5,000,000. It is proposed to erect a dam near Bradford for water storage from the watersheds of Lakes Keuka and Lamoka, in central New York, and build a power house at Keuka.

Associated Gas & Electric Construction Program.—Directors of the Associated Gas & Electric Company have authorized an expenditure for new construction during the early part of 1925 of approximately $2,000,000. The major part of this will be expended on the upstate New York properties in the construction of new transmission lines. On the properties in central New York approximately $1,500,000 will be expended. Appropriations of $150,000 in eastern New York State, $150,000 in the Harlem Valley, $180,000 on the Kentucky-Tennessee properties and $120,000 on the Cape Cod properties, all operated under the management of the J. G. White company, were approved.

Oroville, Cal., Considers Municipal Ownership. — A definite step looking toward municipal ownership of its light and power distribution system was taken recently by the city of Oroville, Cal., when it asked the State Railroad Commission to make a valuation of the privately owned system serving the city, which is the property of the Pacific Gas & Electric Company of San Francisco. Oroville considered municipal ownership as far back as 1917, when it obtained a valuation figure of $97,000 for the private system from the commission. The city trustees are now said to feel that it is time to put the question to a vote.

Province of Alberta Not Enthusiastic About Public Ownership of Spray Lakes Project.—According to a correspondent of the Toronto *Financial Post*, it is now almost a certainty that the provincial government of Alberta will not have anything to do with the project for developing water power from Spray Lakes on the western border of that province. The government estimates that the scheme would involve an expenditure of approximately $15,000,000. An exhaustive report made by officers of the Ontario Hydro-Electric Power Commission is

reported to have shown conclusively that the best plan would be to link up the proposed plant with the Calgary Power Company, and this company is said to be prepared to undertake the project if the province turns it down.

Imports of Canadian Power Fall Off in January.—Exports of electrical energy from Canada during the ten months of the fiscal year ended January were 1,059,651,910 kw.-hr. compared with 1,176,156,201 kw.-hr. during the same period ending January, 1924, and 875,625,672 kw.-hr. during the 1922-23 period. Exports during January this year were 91,300,260 kw.-hr., compared with 113,599,479 kw.-hr. during January, 1924.

University of Oregon Establishes Second Utility Course.—The University of Oregon, Eugene, has added this year a second course in the public utilities branch of its department of economics entitled "public utility problems." In this course are discussed such problems as the promotion and financing of utility companies, the movement toward consolidation, public relations, customer ownership, valuation and rate making. The first course, instituted in 1920, is in "government control of public utilities." It has proved popular.

Territorial Invasion in Massachusetts Adjusted by Commission.—The New England Power Company and the Worcester Suburban Electric Company have reached an agreement concerning the distribution of power in Mendon, Mass. The town of Mendon sought power from the New England company with the approval of the Department of Public Utilities, and the Worcester Suburban Company at first objected on the ground of an invasion of its territory. The New England Power Company will supply electricity in bulk only.

Utah Power & Light Company's Bear River Station.—Construction of the 30,000-kw. hydro-electric plant which, as reported in the ELECTRICAL WORLD for December 20, page 1325, is to be built by the Utah Power & Light Company on the Cutler site on the Bear River, about 17 miles northwest of Logan, Utah, will begin in a very short time. Further particulars of this plant are that power will be generated at 6,600 volts, stepped up to 130,000 volts at the station and transmitted to the company's Terminal substation, 7 miles west of Salt Lake City, over a new transmission line 80 miles long. A steel-pipe line 1,100 ft. long and 18 ft. in diameter will convey the water to the penstocks. The Phoenix Utility Company will handle the construction work.

Small Dam Only May Be Built to Augment Skagit Plant.—The City Council of Seattle has instructed the members of the Skagit Power Survey Commission what is expected of them in the way of a report on the Skagit project. The commission has been told that it is expected to present an absolutely unbiased report, and it is to have a free hand to secure information and formulate an opinion. A plan will be laid before the commission providing for a dam at Ruby Creek smaller than any that has been contemplated, and it will be asked to determine whether a 250-ft. dam will increase Skagit power to an amount sufficient for the immediate future. Present plans are for a 1,740-ft. dam at Ruby estimated to cost $8,000,000. Consultations with engineers have given councilmen the idea that a 250-ft. dam will suffice for a considerable time.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, January 3, page 76.]

American Institute of Electrical Engineers—St. Louis, April 13-17; Swampscott, Mass. (regional), May 7-9; Saratoga, N. Y., June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

New Mexico Electrical Association—Albuquerque, April 20-22. B. L. Wiles, Albuquerque, N. M.

Southeastern Water and Light Association—Hotel Patten, Chattanooga, Tenn., April 21-23. W. F. Steiglitz, Columbia, S. C.

Southwestern Division, N. E. L. A.—Eastman Hotel, Hot Springs, Ark., April 21-24. S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.

Arkansas Utilities Association—Hot Springs, Ark., April 21-24. R. I. Brown, Arkansas Central Power Co., Hot Springs, Ark.

American Welding Society—New York, April 21-26. Miss M. M. Kelly, 29 West 39th St., New York.

American Electrochemical Society—Niagara Falls, N. Y., April 23-25. C. G. Fink, Columbia University, New York.

Southwestern Public Service Association—Rice Hotel, Houston, Tex., May 5-8. E. N. Willis, 403 Slaughter Bldg., Dallas.

Missouri Association of Public Utilities—Joplin, Mo., May 7-9. F. D. Beardslee, 315 North 12th St., St. Louis.

American Society of Mechanical Engineers—Milwaukee, May 18-21. C. E. Davies, 29 West 39th St., New York.

Electrical Manufacturers' Club—Hot Springs, Va., May 19-22. S. B. Belden, Jeffrey Manufacturing Co., Columbus, Ohio.

Middle West Division, N. E. L. A.—Hotel Fontenelle, Omaha, Neb., May 20-22. (Conjointly with Nebraska Section.) H. M. Davis, Fraternity Building, Lincoln, Neb.

Georgia Electrical Association—Atlanta, May 21-22. W. W. Barr, Georgia Railway & Power Co., Atlanta.

Electric Power Club—Hot Springs, Va., May 25-28. S. N. Clarkson, B. F. Keith Bldg., Cleveland, Ohio.

Electrical Supply Jobbers' Association—Hot Springs, Va., June 2-5. Franklin Overbagh, 411 S. Clinton St., Chicago.

American Association of Engineers—Orlando, Fla., June 2-5. C. E. Drayer, 63 East Adams Street, Chicago.

Iowa Section, N. E. L. A.—Waterloo, Iowa, June 3-4. H. E. Weeks, 623 Union-Davenport Bldg., Davenport.

National Electrical Credit Association—Atlantic City, June 6-7; Philadelphia, June 8-9. F. P. Vose, Marquette Bldg., Chicago, Ill.

Associated Manufacturers of Electrical Supplies — The Homestead, Hot Springs, Va., June 8-12. F. Nicholas, 30 East 42d St., New York.

Northwest Electric Light and Power Association (Geographic Division N. E. L. A.)—Gasco Bldg., Portland, Ore., June 12. W. A. White, Puget Sound Power & Light Co., Portland.

Pacific Coast Electrical Association (Geographic Division N. E. L. A.)—San Francisco, June 15. S. H. Taylor, 529 Rialto Bldg., San Francisco.

National Electric Light Association—San Francisco, June 15-19. M. H. Aylesworth, 29 West 39th St., New York.

Society for the Promotion of Engineering Education — Union College, Schenectady, N. Y., June 17-20. F. L. Bishop, University of Pittsburgh, Pittsburgh.

Tennessee Electric Finishes Raising Caney Fork Dam.—Last week the Tennessee Electric Power Company finished its task of doubling the height of its dam at the junction of the Caney Fork and Collins Rivers, near Rock Island, Tenn. This will increase the generating capacity in the power house at the dam from 13,000 hp. to about 33,000 hp., a new 15,000-kw. Allis-Chalmers turbo-generator having been installed. The dam is now 75 ft. high, with eighteen steel floodgates, and a 150-ft. head of water is obtained. The undertaking cost about $3,000,000 in all.

Three Hydro-Electric Projects in Iowa Are Authorized.—The State Executive Council of Iowa has issued permits to three utility companies to erect dams in the state for the development of power. The Interstate Power Company, Chicago, will build a dam in Allamakee County, and the Central Iowa Power & Light Company will build dams at Floyd and Orchard, Mitchell County. Opinion among members of the Executive Council seems to favor imposing fees on the pro rata basis of the horsepower development from the dams.

Another Transmission Line Across Mississippi Projected.—The Utilities Power & Light Corporation of Chicago is petitioning the government army authorities for permission to erect a high-tension transmission line across the Mississippi River at Dubuque, Iowa. This line, like the one to be built by the United Light & Railways Company between Davenport, Iowa, and Moline, Ill., will have to be built with high towers on each side of the river to prevent interference with navigation.

Virginia Rural Service Experimental Line Built.—The Fairfield (Va.) experimental farm line is almost ready and will be energized in the very near future, according to L. D. Ellis, chairman of the state committee in charge. Thirty-nine farmers living in Henrico County will use energy from this line for lighting their homes and farm buildings and for power. The experiment has been made possible through the co-operation of the committee, the farmers and the Virginia Railway & Power Company. Energy, it is stated, will be furnished at the rate charged city consumers.

Indiana Commercial Men Meet.—More than one hundred men and women representing the commercial departments of nearly all light and power companies in Indiana that are members of the Indiana Electric Association met in Terre Haute recently. Wallace O. Lee of Indianapolis, chairman of the commercial department of the association, explained the work of that department. Mr. Lee has divided his state committee into three sub-commit-

tees arranged geographically, one for the southern, one for the central and one for the northern district. The meeting was in the charge of the northern district, of which W. O. Wallace of Terre Haute is chairman. He presided at the sessions. Prof. G. I. Christie of Purdue University spoke of the part played by electricity in better living on farms. I. C. Shepherd of Evansville. Earl Carter of Indianapolis, chief engineer of the Indiana Public Service Commission; H. E. Tobey of Vincennes and Roy Thurman of Muncie were other speakers.

First Two Units of Peoria Plant Nearly Ready. — The first of the two units under way for the ten-million-dollar power plant being erected at East Peoria, Ill., by the Central Illinois Light Company is making successful preliminary runs, and the second unit is nearly ready for its trials. These two units will develop about 40 per cent of the ultimate 133,000-kva. capacity of the plant. They will be in operation April 1. Power-line connections will have been made by that time with Springfield, substation connections being the only unfinished work.

Further Extension to Dallas Plant.— The Dallas Light & Power Company, which placed in service last September a 20,000-kw. turbo-generator, now contemplates installing an additional unit of the same rating, which will bring the total capacity of the plant to 55,000 kw., making it the largest in Texas. To house the contemplated addition a new building adjoining the present power plant will be erected on space now occupied by inadequate equipment. Several years will be occupied in making this and other extensions and the cost will reach about $2,000,000.

Senator Blease Asks Government to Investigate South Carolina Power Company.—Before the adjournment of the special executive session of the United States Senate, Senator "Cole" Blease, newly elected from South Carolina, introduced a resolution which was referred to the military affairs committee directing the Chief of Engineers of the War Department to investigate the Broad River Power Company, a Barstow subsidiary operating at Columbia and Parr Shoals, S. C. Senator Blease would have the Chief of Engineers ascertain who the incorporators and stockholders of the company are and whether it has the legal right and power to build dams across the Broad and Congaree Rivers. The resolution further directed that the engineers find out whether the company contemplates additional projects and, if so, whether these conform to the acts of Congress.

More Time for Electrification of New York City Railroad Tracks. — A bill passed in the New York State Senate last week gives the railroads having tracks within the boundaries of Greater New York until 1929 to change their motive power from steam. By the terms of the bill passed last year this work was to be completed by 1926. The bill affects the Long Island Railroad, the Baltimore & Ohio and the New York Central, the freight tracks of the last-named railroad on Manhattan Island being a main subject of legislative wrangling. Last year's bill called for electrification of all city tracks on which steam locomotives were still used. The new measure leaves it to the Public Service Commission and the Transit Commission to determine what motive power other than steam shall be used.

Municipal Ownership Idea Dropped in McCook, Neb.—Municipal ownership agitation in McCook, Neb., came to a sudden stop on March 23, when the City Council repealed an ordinance calling a special election for April 7 to pass on an electric light bond issue for $172,000. Convinced that the bond issue had small chance of public approval, the Council entered into negotiations with the Nebraska Light & Power Company which resulted in an adjustment of rates to an approximate average of the rates in other small Nebraska cities. The local papers say that the settlement meets with virtually universal public approval.

Northwest Association Will Subordinate Convention to N. E. L. A. San Francisco Meeting.—At a meeting of the executive committee of the Northwest Electric Light and Power Association held at Portland, Ore., March 9, it was decided to hold the 1925 convention of the association June 12 in the auditorium of the Gasco Building, Portland. At this time the reports of committees will be received and an executive session will be held for the election of officers for the ensuing year. Plans for a convention of the usual size and duration were abandoned on account of the convention of the National Electric Light Association in San Francisco on June 15, of which the Northwest association is a geographic division and which will be attended by many members from the Northwest.

Kewanee, Ill., Adjusts Price of Former Municipal Plant.—The end of the municipal-plant problems of Kewanee, Ill., is seen in an announcement of the acceptance by the Kewanee Public Service Company of the city's offer to take $130,000 for its municipal light plant, now operated by the company. In accepting the offer the company increases its bid from $125,000. The light plant was well under construction last year, when the city by a large majority voted against municipal utilities and in favor of a plan which brought about the organization of the Kewanee Public Service Company to consolidate the city plant and the existing private company. (See ELECTRICAL WORLD for June 28, 1924, page 1351.)

Men of the Industry

Cities Service Transfers Officials

B. C. Adams, vice-president and general manager of the Toledo Edison Company, a subsidiary of the Cities Service Company, has been named vice-president and general manager of a company to take over a number of gas-distributing companies which the Cities Service Company is planning to acquire. C. L. Proctor, vice-president and general manager of the Empire District Electric Company at Joplin, Mo., also a Cities Service property, will succeed Mr. Adams in Toledo, and James E. Harsh, who has been vice-president and general manager of the Virginian Power Company, will succeed Mr. Proctor. J. Frank Johnson, who has been operating superintendent of the Community Traction Company in Toledo, has been promoted to the position of general manager to succeed Mr. Adams.

Norman S. Braden, vice-president of the Canadian Westinghouse Company, has been appointed a director of the company.

W. Lawrence Weston, for several years manager of the Nova Scotia Tramways & Power Company, Ltd., has been appointed manager of the Woonsocket (R. I.) division of the Blackstone Valley Gas & Electric Company. Both these properties are under Stone & Webster management.

George R. Lunn of Schenectady, formerly Lieutenant-Governor of New York, has been appointed a member of the New York State Public Service Commission by Governor Smith to succeed Oliver C. Semple, whose term expired February 1. The appointment is for a term of ten years.

Joseph W. Cowles, superintendent of the installation department of the Edison Electric Illuminating Company of Boston, was the recipient of a gold watch, chain and charm from his associates in the company, March 21, upon the occasion of the thirtieth anniversary of his connection with the Edison organization.

Charles G. Ward, president of the Ward Motor Vehicle Company, and **Herman Plaut,** president of L. Plaut & Company, both of New York, have been elected to the board of directors of the Society for Electrical Development to succeed A. G. Kimball and E. N. Hurley, representing the manufacturing and "at large" groups on the directorate respectively.

J. B. Kilmore, formerly district manager of the Pacific Power & Light Company at The Dalles, Ore., has been appointed to a corresponding position at Astoria to succeed B. P. Bailey, recently transferred to Yakima.

O. F. Stuefer has been appointed general manager for the Northern Lamp Division of the National Lamp Works of the General Electric Company, with headquarters in Minneapolis. Mr. Stuefer was graduated from the University of Michigan in 1913 and immediately joined the engineering department of the National Lamp Works. After three years with the commercial engineering section he was transferred

to the Federal Miniature Lamp Division at Chicago, where he has since been. Mr. Stuefer will assume the duties of his new office April 1.

Prof. Harris J. Ryan Receives Degree

In recognition of his contributions to the knowledge on the subject of high-voltage transmission and phenomena, Harris J. Ryan, professor of electrical engineering at Stanford University and junior past-president of the American Institute of Electrical Engineers, has been made a doctor of laws. The

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degree was conferred upon him by the University of California at a fitting ceremony at the Greek Theater on the university campus March 23, the occasion being the annual charter day celebration of the university.

At a banquet at the Hotel Oakland in the evening Professor Ryan was the guest of honor, and business and professional men paid their respects to him for his contributions to the advancement of electrical engineering. Professor Ryan is held in high esteem by all associated with him during his many years at Cornell and later at Stanford. At Stanford he has applied himself largely to research problems related to high-voltage transmission. His work has been distinguished by his advanced conception of the mechanics of electrical phenomena, particularly at the higher voltages. He is responsible for the development of a high-voltage wattmeter for measuring corona and other power losses on high-voltage circuits. This instrument has been so perfected that the power of a single brush discharge and power losses as small as a quarter of a watt may be measured on a 220-kv. line.

Professor Ryan is looked upon as one of the foremost authorities on the subject of corona, and his cathode-ray oscillograph studies, beginning as early as 1900, have added much to the knowledge of the dielectric properties of air and the phenomena of corona. In the new two-million-volt laboratory to be erected at Stanford University, announced last week in the ELECTRICAL WORLD, there will be installed as a part of the equipment an experimental steel-tower transmission line at least a mile in length on which potentials up to 1,000,000 volts, three-phase, or 2,000,000 volts, single-phase, 60 cycles, may be obtained. Here Professor Ryan will have an opportunity to carry his research work to a point heretofore impossible with the lower voltages available.

R. F. Tracy has been appointed superintendent of the Southern Cities Power Company at South Pittsburg, Tenn.

William E. Pearson has been placed in charge of the security sales department of the New England Power Company, with headquarters in Worcester, Mass. Mr. Pearson has been on the company's staff since its organization seventeen years ago and has specialized in right-of-way work. He has also been appointed a special representative of Baker, Young & Company, Boston, fiscal agents of the New England Power Company system since its inception and will handle the complete line of that house's securities.

J. A. Fowler New President of Electragists

Joseph A. Fowler, who was elected president of the Association of Electragists International last week, as already announced in the ELECTRICAL WORLD, has been identified with the electrical business in Memphis, Tenn., for the past twenty-six years. In his home city Mr. Fowler enjoys the reputation of being an excellent organizer and harmonizer. He is known for his ability to bring disagreeing factions together and to obtain their co-operation. These traits coupled with more than twelve years of service on the executive committee of the association fit him unusually well to lead the organized electrical contractors and dealers.

In 1910, at the age of twenty-seven, Mr. Fowler established the Fowler Electric Company with a capital of $1,500, and from this beginning he has been successful in building his business to its present volume of from $150,000 to $250,000 a year. During his term of service as executive committeeman Mr. Fowler has made a number of important contributions to economic advancement based on constructive thought. He was instrumental in securing for electrical contracting a separate classification in liability insurance, his work as chairman of the liability insur-

J. A. FOWLER

ance committee quickly resulting in relief from onerous conditions. Where previously it was the policy to give no set rates or classification to electrical contracting, this occupation is now recognized as one of the less hazardous of the building trades.

Obituary

Charles C. McBride, treasurer of the West Penn Company, the West Penn Power Company, the West Penn Railways Company and subsidiary companies, died on Friday, March 13.

J. Starr Butler, one of the most widely known General Electric salesmen in New England, died suddenly at Winchester, Mass., March 22. Mr. Butler was fifty-four years of age and had been in the employ of the General Electric Company for thirty-three years, beginning work in 1892 under F. M. Kimball, the present manager of the small-motor department. Most of his work, however, was in the supply department, and at the time of his death Mr. Butler was representative of the company's merchandise department in western Massachusetts.

Walker Powell, president of the Dixie Power Company, has died at his Tulsa (Okla.) home, according to a private dispatch received at Denver. The Dixie Power Company has a preliminary permit to build a large hydro-electric plant on the White River in Arkansas. This permit, it will be remembered, led last year to a sharp controversy between the Dixie Power Company and the Hugh L. Cooper Company. When the Dixie company's three-year permit expired without the company's being in a position to take out a license, the Cooper company applied for rights on the site; but Congress came to the relief of the Dixie company by passing a special act to permit the extension of its permit until October of this year.

Ernest J. Bagnall, pioneer in the electric lighting and electric railway industries, died March 16 at his home in Cleveland after an operation for appendicitis. He was connected with the Brush Electric Company of Cleveland prior to 1880 and soon after formed the firm of Bagnall & Dutton, who took over, managed and operated the Brush electric light station in St. Louis, which was the first electric lighting station in that city at that time. About 1889 he organized the Southwestern Electric Engineering Company, which installed a large part of the original incandescent wiring in St. Louis. After returning to Cleveland Mr. Bagnall organized the Adams-Bagnall Electric Company which developed the "A-B" arc lamp. While operating the Adams-Bagnall company he carried on extensive development in electric coal-mining machinery. He organized and operated the Fuller's Earth Company, which undertook considerable electrochemical development in its early stages in the United States. He was sixty-seven years of age.

Commission Rulings

Principles Governing Rates for Undeveloped Utility.—In fixing gas rates for the Menominee & Marinette Light & Traction Company the Wisconsin Railroad Commission, pointing out that the company, which purchased the business in 1922 and has since then spent large sums in developing it, could not fairly ask to have its property evaluated at average unit costs, said that the commission's findings should be based more upon the reasonableness of the rates requested than upon present investment in plant and prevailing costs of operation, which were necessarily considerably in excess of those derived from the investments and operating data of plants of a similar size in the state that have enjoyed a larger period of development.

Public Use Does Not Mean Merely Domestic Use.—In granting to the Niagara, Lockport & Ontario Power Company the right of eminent domain in respect to lands adjacent to its water-power development on the Salmon River and necessary to its enlargement, the New York Public Service Commission, pointing out that the state had announced its policy to be that water rights may be acquired in certain instances when in the interest of the public by the exercise of the right of condemnation, not only by the state itself but also by private corporations engaged in the production of light, heat and power for public use, had to meet the objection from the owners of the land in question that it was not to be applied to a public use since 65 per cent of the petitioner's power goes to electric railways, distributing companies and industrial users. On this point the commission said: "It is our view that any electric railroad, any distributing company, or any industry within the territory served by the petitioner, under reasonable and proper regulations, may demand and is entitled to receive the services of the petitioner equally with any domestic user. The petitioner is a public service corporation within the definition of the Public Service Commission law; it keeps its accounts according to the methods prescribed by the commission; it reports to the commission as required by statute and is wholly under the regulatory and supervisory power of the commission. Its sales to large consumers are covered by contracts, but these contracts are filed with the commission and subject to its regulation as to price, quality of service and other matters. . . . The business of an electrical corporation is different from that of other public utilities. Electricity cannot be commercially stored. It is therefore necessary for an electric corporation to have an equipment sufficient to meet its highest demand for service. It is in the interest of the public that the load of the generating equipment be equalized as far as possible between all classes of users and thus keep equipment in operation. This is and can be done by furnishing service for industrial purposes. . . . It is our opinion that the sales by petitioner of electricity for heat, light and power are for a public use and the production of heat, light and power at the proposed site is necessary for public use. It follows that the real property described in the petition and shown upon the map attached thereto is necessary for the full development and utilization of the single undeveloped water-power site set forth in the petition, of which we have found the petitioner owns the major part of the head and volume of the usable flow."

Obligation to Serve Territory Extends to Subsequent Additions to That Territory.—The Pennsylvania Public Service Commission pointed out in a case where the Lansdale Water Company objected to extend its service to a district added subsequently to the company's incorporation to the borough it had agreed to supply that a recent decision of the Superior Court holds it to be obligatory upon a utility company having the right to serve a municipality to serve also in territory subsequently annexed thereto, the right and the duty being correlative and the latter enforceable by the commission.

May a Utility Refuse Service to Customer in Arrears?—On this question, concerning which the authorities are not in complete accord, the Wisconsin Railroad Commission recently said, the case being one affecting the Chicago, Milwaukee & St. Paul Railway Company: "This commission has taken the view that where credit has been extended for service rendered in the past the public service company is limited to its remedy at law for the collection of charges for such service, and that while it may protect itself for future service by the requiring of a deposit or of a bond to secure payment therefor, or by requiring prepayment for the service, it may not enforce collections by a refusal further to serve. Particularly is this true where the charge for the past service is in dispute, since otherwise a public utility might use its monopolistic character to obtain an unfair advantage over its patrons."

Unfairness of Penalizing Efficiency and Economy.—Efficiency and economy in management and operation must not be penalized, declared the California Railroad Commission in fixing rates for the San Jose Waterworks. "This opinion would be incomplete," the commission said, "if reference were not made to the contention of the city of San Jose to the effect that by reason of the conservative methods of financing and the economical policies of management and operation which have always characterized this utility it is not entitled to the same rate of return upon its investments as those utilities whose costs of financing have been relatively much greater." The commission declared the city's contention untenable and held that the policy pursued by the waterworks in always financing its projects through the issue of capital stock and in refraining from the payment of unduly large salaries deserved encouragement, not punishment.

Recent Court Decisions

Duty of Electric Company to Inspect Wires.—Laying it down as a well-settled principle that central-station companies must inspect their transmission wires at reasonable intervals, mending them and keeping them in repair, the Supreme Court of Arkansas sustained a judgment for the plaintiff in Cullen vs. Arkansas Light & Power Company. This suit was to recover damages for the death of a man who saw a fallen wire on the ground, near which children were playing, and, remarking that it was a house wire, took hold of it where it was insulated and attempted to remove it. It proved to be a 2,300-volt wire and the man was killed. The court disregarded the plea of contributory negligence, on the ground that the victim had some reason for such a mistake, and held that evidence to the effect that the wire was rotten and that the defendant's plant was not equipped with "kick-out" switches justified the submission to the jury of the question whether the company's negligence caused death. (268 S. W. 12.)*

United States Supreme Court Refuses Jurisdiction in Tuolumne Ditch Case.—The appeal of the county of Tuolumne, the city of Sonora and others from a decision of the Supreme Court of California sustaining an order of the California Railroad Commission increasing water charges for the Tuolumne ditch because of its exclusion of earnings from hydro-electric developments on the ditch was dismissed for want of jurisdiction by the United States Supreme Court March 16 without a written opinion. The case involved the construction of the contracts made with water users by the Tuolumne County Water Company in 1850, when the ditch was constructed, by which, it was contended, the charges against users of water for irrigation purposes and for consumption were to be reduced by any earnings from power or other uses of the water. Originally there were earnings from the use of water for mines and from its use as direct power over waterwheels. Eventually the Phoenix hydro-electric power plant was established. This is now controlled by the Pacific Gas & Electric Company, and this company also controls the ditch. In 1922 the Pacific Gas & Electric applied to the State Railroad Commission for an increase in rates charged water users. The commission, excluding earnings of the Phoenix power plant, approved water rates representing an increase of 100 per cent. The county, several municipalities and various water users as individuals and as an association carried the case to the State Supreme Court, which affirmed the action of the Railroad Commission. The United States Supreme Court found no reason for federal interference.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

Business Growth Predicted

Electrical Manufacturers' Opportunity to Reduce Costs in Business and Home

A HEALTHY growth of business with spectacular figures lacking was predicted by Dr. H. R. Tosdal, professor of marketing in the Harvard Graduate School of Business Administration, in testifying as an expert witness recently in the New England telephone rate case before the Massachusetts Department of Public Utilities. Dr. Tosdal declared it was evident that greatly increased imports should not be expected from Europe during the next five years. "Of the ten billion dollars in the world's gold supply available as money," said Dr. Tosdal, "the United States has about one-half. We are already doing a normal business and can expect no great increase, as we might if we were doing say 75 per cent of normal. Our frontier is gone, and there are no huge natural resources to be developed in a few years as was the case after the Civil War."

Dr. Tosdal said that in his opinion the "slack" in American manufacturing plant capacity that followed the war has now been taken up and that there is now no marked excess above normal. Wages are now higher than general prices and one cannot expect a general lowering of wages. Restricted immigration lowers the labor reserve. Although labor is somewhat more efficient than in 1920, it seems unreasonable to expect an increase in the efficiency of labor during the next few years sufficient to offset the present disparity between wages and prices. Reasons against expecting greatly increased imports from Europe at present are (1) scarcity of raw materials, (2) stabilization of currency in Europe, which is doing away with some of the artificial advantages exporters in some countries have had, (3) rising rents and labor costs in Europe, and (4) the American attitude favoring tariff protection. To a representative of the ELECTRICAL WORLD Dr. Tosdal pointed out that the situation favors increased activity in the production and application of labor-saving devices and cost-cutting methods based on electrical service in business and in the home.

Millions Lost in Packing

Department of Commerce Conducts Survey and Issues Compendium of Best Information

"THE millions of dollars lost annually through careless or injudicious packing which invites pilfering and destroys goods through breakage or other damage is a tax on industry which all those sharing in the distributive process should join forces to eliminate," says Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce, in a statement recently issued. "Realizing the necessity of cutting down this marginal waste, the House committee on merchant marine in 1921 requested the Transportation Division of the Department of Commerce to make a nation-wide survey. After three years of intensive field investigation, study and technical research, conducted in co-operation with shippers, container manufacturers and the Forest Products Laboratory, the department has just published the results of its findings in 'Packing for Foreign Markets.'

"The best practices evolved from the rich experience of some of our oldest export houses, as well as the exact results of thousands of scientific tests, are covered in this publication. The fundamental principles which these studies have disclosed can be applied by any shipper of any commodity and with almost as much force to the domestic as to the foreign field.

"In addition to primary rules on container construction and packing which apply in an equal degree to almost all articles, the book presents a study of the problems peculiar to the products of many of our more important industries. Chapters, with specification charts, are devoted to commodity groups, such as machinery, agricultural implements, automotive products, iron and steel. Copies may be obtained by application to the Superintendent of Documents, Government Printing Office, Washington, or through any of the district or co-operative offices of the Bureau of Foreign and Domestic Commerce. The price is $1.25."

Mistake of "Selling the Industry Short"

Manufacturers of Transmission-Line Equipment Need Not Be Influenced by Temporary Fluctuations—Apparatus Less Affected than in Many Fields

BY A. M. JACKSON
Locke Insulator Corporation, Chicago, Ill.

THE boards of directors of many electric equipment manufacturers include men who have gained their earlier business experience in the fields of banking, mercantile enterprises or in the manufacture of staple commodities, and such men are often influenced in their attitude toward production programs and plant expansion by market conditions existing at any particular time. With average commodity prices low and much productive equipment idle in the general manufacturing field, these men are inclined to insist on retrenchment, reduction of inventory and perhaps the scaling down of prices. This is a practice that has been followed quite generally and successfully by many able men in other lines of manufacture who have later become directors of electric manufacturing companies. It will be of interest, therefore, to consider the rather special conditions existing in connection with transmission line and switching equipment and to compare them with conditions in the general manufacturing field, with the idea of pointing out the essential differences in the policies that may be safely followed in either case.

A leader in the world of finance during the past generation is reported to have declared that he would "never sell the United States short," thus indicating his belief that, taken over a period of years, the values of property and commodities will not decrease, but will, on the other hand, appreciate. This gentleman, while realizing and taking advantage of seasonal fluctuations in market prices, was at the same time confident that the long swing of the industrial and commercial cycle of prices and business expansion would be gradually upward. While there are certain branches of the electrical industry that follow the seasonal fluctuations of general business conditions, I believe it may be asserted with safety that in the transmission-line and switching-equipment field at least the tendency is now and will continue to be ever toward a higher level of activity and continued expansion, with very few if any periods of marked slackening or falling off in the demand for products that go into transmission lines. For this reason it is safe to say that manufacturers engaged in the production of transmission-line products should never fear a falling market.

TRANSMISSION FIELD MUST GROW

Three conditions are necessary for the continued and healthy growth of any business. These conditions are, first, a demand for the commodities produced; second, available funds with which to purchase these commodities, and, third, public confidence to insure the permanency of the enterprise purchasing the commodities.

Considering the matter of demand, it is well to observe the conditions that create a demand for transmission-line products. These conditions may be stated as: (a) Normal load increases —10 to 15 per cent annually; (b) extensions of systems—additions of new towns and isolated plant load; (c) interconnection—by tie lines between stations and systems. All three of these conditions are creating a con-

stantly increasing demand at the present time, and the influence of all will continue to be felt in the years ahead. However, at the present time and for the immediate future it would seem that the chief condition for increased demand for transmission-line equipment would come from interconnection.

INTERCONNECTION IMPORTANT FACTOR

Interconnections and the consequent demand for transmission-line products result from a desire to tie together scattered generating stations of single companies, to provide for interchange of power between different power companies and to provide for the economical transmission of power in large quantities from plants of large rating at strategic points. The importance of these outlets for transmission-line products may be seen from the fact that while many smaller operating companies have built their lines to cover fairly well their entire territory and have brought their system up to a point where it is limited by the presence of other systems, the consolidation of these smaller systems with larger organizations generally results in immediate construction of tie lines and even superpower trunk lines. These conditions are to be found right today, when manufacturing activity in certain locations is relatively quiet.

The important element in the interconnection situation is that construction for this purpose is likely to go on regardless of temporary business conditions, because these interconnections are quite often made for reasons of economy as well as for providing increased capacity. From the above brief considerations it would appear that the demand for transmission line and switching equipment may be reasonably assumed to continue at its present rate and at a gradually increasing rate as time goes on.

AMPLE FUNDS AVAILABLE

The heavy demand for transmission-line products would be of little value if the companies requiring these products were not in a position to pay for them. It is reassuring, then, to contemplate the present financial condition of the majority of the electric utilities and to appraise their ability to continue their present construction program so far as transmission lines are concerned for many years to come. The ability of utilities to finance construction programs properly depends much on public confidence. The assistance of widespread confidence in the utilities makes possible the securing of large funds at lower interest rates than would exist if the supply of money were limited to those men or banking organizations who were in a position to know the condition of the utilities from first-hand information.

PUBLIC CONFIDENCE GROWING

The remarkable growth of customer ownership of electric utilities is an evidence of the growing confidence on the part of the public in the economic soundness of electric utility enterprises. During 1924 approximately $200,000,000 worth of securities were sold direct to customers of light and power companies in the United States. About $980,000,000 was sold through investment houses, making a total of stock, bonds and all forms of light and power company securities sold during 1924 amounting to $1,180,000,000. One has only to compare this record with the security sales of ten or even five years ago to appreciate the vast resources that have been uncovered and made available for electric utility development. During February of 1925 more than $140,000,000 of utility securities was sold. This is a greater volume of security sales for utilities than has occurred in any one previous month of the industry's history. With this record behind, with the still undeveloped field of electric service application ahead, and with the public confidence in utilities increasing every year, it would seem that the ability of utilities to pay for their transmission-line construction programs will continue beyond question.

MANUFACTURERS' RESPONSIBILITY

Manufacturers of equipment have in the past played a large part in the remarkable development of transmission-line enterprises. Manufacturers have been responsible for the vastly improved quality of their products and for production in large quantities at fair prices and have striven to meet all the requirements that the development of the art has imposed. With the industry entering upon an era of unprecedented development, consolidation and centralized control, the manufacturers of transmission-line products and switching equipment have a great responsibility which must be recognized and assumed. Facilities for providing equipment to meet the present needs of utilities must thus be continued by manufacturers. They must be prepared to anticipate the normal growth in the demand for their products. They must be prepared to take care of additions made to existing transmission systems. They must prepare for the demands arising from interconnection. They must study the demands of superpower developments and have facilities for production ready to meet this important demand. They must be prepared to meet the demand for higher and higher voltages. They must be prepared to care for replacements, remembering that within a few years replacements of equipment will, on account of the tremendous expansion during the past few years, amount to more than the total output of some years ago. Many items entering into transmission-line construction have rather a definite life. A certain percentage of these products must be replaced every year. If this replacement be only 1 or 2 per cent, it may still become very important, considering that the rate of construction during the past year has been many times that which existed a decade ago.

Such a program must necessarily carry with it a policy of continuous careful, but optimistic, application of money, material and thought to the expansion, development and improvement of facilities of manufacture. The utilities have a program of development that extends for perhaps ten years ahead and they are confident of the future. Manufacturers of transmission-line equipment should have at least as comprehensive a program and their development should be gradual, steady and intelligent and not influenced by temporary conditions of the general commodity market. They should share this confidence in the future of the industry. They should believe in the extremely bright future of the utility business with all its ramifications. They should "never sell the industry short."

Electragists Define Policy

Executive Committee Agrees on Trade Policy for the Distribution of Electrical Merchandise

THAT there may be no question concerning the attitude of the Association of Electragists International, the executive committee on March 17 unanimously agreed that the only trade policy that can be justified as economically sound is that the distribution of electrical merchandise should be from manufacturer through jobber to contractor and dealer to consumer.

"This determination of the executive committee," says Joseph A. Fowler, new president of the association, "follows the investigation of our trade policies committee, which brought out some of the evils surrounding the orderly distribution of electrical materials. For some time contractors and contractor-dealers have complained bitterly about the practice of manufacturers and jobbers bypassing them at equal or even lower prices. The existence of this situation is not denied, but the counter charge is made that the contracting branch of the industry has not kept its skirts clean nor has it had a definite policy. It must be admitted that many contractors and dealers have sought to eliminate the jobber in obtaining their supplies.

MARKET CANNOT BE BUILT ON PRICE

"We have thus recognized the orderly principle of distribution which has been instrumental in building the electrical business. Without this direction to the movement of supplies there can only be discrimination, price cutting and bad feeling. Any breakdown of this principle must result in a market based on price only. When price is the governing factor service has little opportunity to make headway. If the electrical industry is to maintain its reputation for dependability and service, it must not build a market solely on price. If the disturbing factors which have entered into the movement of electrical merchandise from producer to consumer are to be eliminated, this orderly principle of distribution must not only become our preachment but our practice.

"With this policy we maintain that a channel of distribution can be set up that is fair, equitable, sound and logical. As an evidence of good faith every member of our association should recognize his individual responsibility in making the policy effective. If we are able to crystallize this attitude in the individual conduct of our members, we believe that the manufacturer and the jobber will each feel that he has the corresponding obligation and will co-operate to the fullest extent in the realization of this ideal."

Business Conditions

SALES of electrical apparatus are continuing in good volume with a slight decrease noted, as compared with the first of the year. The tone of the market is firm, and electrical men expect a normal increase next month with good sales the rest of the year. While all central-station companies are steadily purchasing materials, some of them are especially active, and manufacturers are expecting the demand from this source to show a greater increase soon, when major buying of apparatus will take place in line with 1925 budgets. As stated by a large manufacturer, if sales are based on 1919 figures and a reasonable judgment, there is no fault to find with the electrical business as conditions are healthy in all lines and bid fair to continue so with normal increases.

Late last week the American Brass Company again announced a large cut in copper and brass products ranging from ¼ cent to ¾ cent per pound. The annual report of the United States Steel Corporation for 1924 shows a decrease in both gross and net earnings as compared with 1923. Regular and extra dividends were earned on the common stock, and the results were considered fairly good under the circumstances, though not yielding a proper return on the value of the investment employed.

In New England electrical sales continue at a steady rate. Several small lighting and power contracts have been closed in that district, and the demand for industrial electric furnaces is very good. A stable ordering of apparatus and supplies continues in the New York district, with the volume slightly lower than in the first part of the year. Manufacturers expect a normal increase next month and good sales for the rest of the year. In the Southeast sales continue spotty but in good volume. Several orders for industrial equipment are being received in certain sections, and central-station companies are active purchasers of material. Construction work is progressing in the Middle West, sales are improving, and central-station companies are purchasing more equipment. On the Pacific Coast industrial purchasing has been in good volume and good orders have been placed by central-station and railroad companies.

Safety Switch Demand Larger than Ever Before

THE demand for safety switches is reported by manufacturers as larger than ever before. Sales in 1924 were very good, but a still larger demand is anticipated for 1925. This is said to be owing, first, to the normal increase expected in the sales of the covered-entrance or meter-service type and, second, to the fact that safety switches are being recognized more and more as a part of the entire safety movement, which requires properly inclosed safety electrical wiring devices.

Deliveries are very good, and there is no indication that this condition will change. Good stocks on hand are said to have been made possible by improvements in manufacturing processes and assure very prompt deliveries. One manufacturer reports quite a large line of developments in his works at the present time covering improvements on various types of safety switches. This manufacturer believes that the future will show a number of improvements in design which will tend to make safety switches more economical as well as more efficient. Prices in general are steady. One company made some reductions early in the year on some of its large-sized switches and offered as its only reason for making these reductions the necessity of meeting competitive conditions. Some price reductions were also made by various companies on the meter-service type. No further changes in price are anticipated.

Sales of Transformers Increasing —Prices Firm—Deliveries Good

THE volume of sales of transformers during 1924 is reported by a large manufacturer as being below that of 1923. With the trend toward centralization of generation and distribution of block power by transmission lines there has been noted a gradual increase in the demand for transformers, especially of the larger capacities and of the higher-voltage class. An abnormal demand is not anticipated during 1925, but improved industrial and agricultural conditions, it is believed, should result in a well-sustained demand for this class of equipment. And again inquiries now on hand, coupled with a review of the construction programs which nearly all of the large central-station companies have prepared for the present year, have led manufacturers to expect a busy year during 1925.

Present development work on transformers is active toward improved cooling and mechanical protection of transformer parts exposed to air. To meet the demand improved means are also being developed to perform tap-changing operations while the transformer is alive. There is every indication that there are ample manufacturing facilities available for the requirements of the trade as present capacity is under-absorbed. The only plant extension reported is an increase in crane capacity being made by one manufacturer to handle larger-sized units. Steel and copper costs have shown a tendency to increase, but raw material and labor are plentiful. Manufacturers are constantly endeavoring by means of simplification and improved methods of manufacture to lower costs of production, and these efforts, to some extent at least, should prove an offset to increasing costs of material unless such increases should be larger than at present apparent.

There has been a tendency to lengthen out deliveries owing to increased demand, but at the present time very attractive deliveries are being offered by several of the transformer builders. Distribution transformers are in most cases available from stock, although in more than one instance some difficulty has recently been experienced in maintaining adequate stocks at various warehousing points. Quoted deliveries vary from five to twelve weeks on transformers up to 1,000 kva., with fourteen to twenty-eight weeks on larger sizes, but in several instances these deliveries have been very much reduced under pressure. Manufacturers believe, however, that if companies will anticipate their requirements for 1925 a little more than was done in 1924, when political conditions resulted in holding orders in abeyance, this co-operation will benefit all concerned. Foreign trade has been comparatively dull, with some increases noted in recent inquiries for quotations. At present there is no demand for transformers over 220,000 volts.

Demand for Higher-Voltage Insulators Showing Increase

A MANUFACTURER of high-voltage insulators, in commenting on his orders for future delivery, reports that the favored operating voltages for which insulators are being ordered are 33,000 volts and 110,000 volts, with a lesser demand for 66,000-volt equipment. This manufacturer considers the prospect for increased demand for the 110,000-volt insulators to be very good.

Sales of Non-Ferrous Metals Increase—Prices Remain Low

SALES of copper were much larger during the past week and the total volume of lead business was somewhat better. Copper and lead declined slightly, but zinc and tin prices held firm. A comparatively large tonnage of copper was sold on Thursday, Friday and Saturday last week, when producers were almost without exception quoting 14¼ cents delivered. The wire drawers were the chief buyers, though the brass mills were also actively in the market. A large electrical company was reported to have bought 5,000 tons at 14 cents, but the alleged seller disclaimed all knowledge of the transaction. Practically all inquiries were for April or May shipment. On Monday, Tuesday and Wednesday there was less interest in the market, owing to the decline in London copper prices.

The official contract price of lead set by the American Smelting & Refining Company continues at 9 cents per pound, New York. The lead market was quiet all week, with one producer making most of the sales. In St. Louis the price of lead was shaded downward nearly every day, the metal finally being sold on Monday a full half-cent below the official New York figure. The bulk of the business placed by consumers was for prompt shipment of

NEW YORK METAL MARKET PRICES

	Mar. 18, 1925 Cents per Pound	Mar. 25, 1925 Cents per Pound
Copper, electrolytic	14¼	14¼
Lead, Am. S. & R. price	9	9
Antimony	15½	14½
Nickel, ingot	31	31
Zinc, spot	7.60	7.70
Tin, Straits	53	53¾
Aluminum, 98 to 99 per cent	28	28

moderate-sized tonnages, indicating that the trade is not well covered but is waiting for steadier prices or an upward turn before ordering larger amounts.

Zinc prices improved somewhat a few days ago, inspired perhaps by better London cables and as high as 7.40 cents was obtained for April zinc on Monday. Yesterday and today the price has shaded off a little, though London has advanced enough to make export business possible for some producers. The export market has been disappointing lately but is expected to take some of the domestic surplus off the market soon. The feature of the tin market has been the buying of tin by London dealers in New York. Consumers have not been active but have left the field almost entirely to dealers.

Demand for Material in New York District in Good Volume

SALES in the New York district are steady and in good volume. Better business transacted during the first part of the year has settled down to a stable ordering of apparatus and supplies in slightly lower volume. A large manufacturer expects to see a normal increase next month and good sales for the rest of the year. Central-station companies are buying general supplies in good volume with some companies particularly active. Transformers are in good demand by industrial firms as well as central-stations, and one company states that it has many inquiries outstanding which concern active business that is expected to be placed shortly.

A manufacturer of control apparatus reports that since the first of the year he has been booking 25 per cent more business than obtained for the same period last year and he finds the tendency upward and industry buying well. Motor manufacturers have been noting a steady demand for small general purpose motors, and in more than one case sales this month are noted as very good. Safety-switch sales are also reported as good. Jobbers' business is fair with no outstanding demands.

Business Spotty in Southeast but in Good Volume

ELECTRICAL business in the Southeastern territory continues very spotty, with almost a cessation of orders from some sections, while a brisk movement is reported in others. Activities in the Atlanta and New Orleans district are somewhat slack, but business in the Birmingham district and in all sections of Florida is excellent. Orders for industrial equipment are being received in reasonable volume from the active districts, and prospects are good for early improvement in this line in the Atlanta district. Central-station purchases of the general run of electrical supplies continues good. Orders for high-tension insulators, switching equipment and transformers are also being received from the larger power companies. An active demand for line materials is reported from Georgia and Florida.

Building construction continues active. The demand for telephone equipment is satisfactory from the Southeast generally and excellent from Florida, a single order of $75,000 having been received from this state recently. Contrary to expectations, the sales of radio receiving sets and accessories have improved in the past two weeks, and while the demand is slightly below the same period last year, prospects are now for a continued reasonable activity well into the late spring. An order was recently placed for a 1,000-watt broadcasting station to be installed at Miami, and another order approximating $20,000 is reported for additions and improvements to the broadcasting station of an Atlanta newspaper.

Construction Progressing in Middle West—Sales Improve

DEFINITE evidence of improvement in business is noticed throughout the Middle West. While it is admitted that the volume of business is a trifle off, as a whole electrical men are optimistic. The various central-station companies are purchasing more equipment and construction is getting under way. An interesting order for coal-crushing apparatus was placed by one utility together with various smaller orders for transformers and meters. A manufacturer of high-tension fuses reports exceedingly good business, and a manufacturer of wire states that he has received more orders for wire and cable this month than in any month last year. The recent tornado in the southern portion of Illinois has created a considerable demand for poles and pole-line hardware.

Jobbers report a normal business. Indications point to a large building program in the Middle West and a good demand for conduit, wire and wiring devices is expected. Appliance sales have kept up well, particularly vacuum cleaners, for which one manufacturer has reported the receipt of a single order for 1,000 machines. Many jobbers are placing their fan requirements at this time, and one company has announced receiving an individual order for 2,500 fans. Prices remain firm, with a few minor exceptions. One company announced a slight reduction in code wire prices, and in Cook County, Ill., armored cable was reduced $1 per 1,000 ft. A manufacturer of high-tension insulators also reduced the price of pin-type insulators from 1 to 9 per cent.

Electrical Sales Steady in New England District

THE letting of several small lighting and power contracts and the buying of new equipment continue steady in the New England district. Street-lighting contracts are engaging the attention of many municipalities throughout this district at this time of the year. Rochester, N. H., has closed a contract with the Twin State Gas & Electric Company for lighting the principal streets of that city at a cost of $12,116, and the Beverly Gas & Electric Company has closed a new five-year lighting contract with the town of Hamilton, Mass. Two mill contracts for power amounting to 1,000 hp. and 800 hp. respectively have been secured by the Edison Company of New Bedford.

There is considerable buying of new equipment for the metal trades and to some extent for mills and factories. One manufacturer of industrial electric furnaces reports the installation of nine units within recent weeks, a considerably better showing than in previous years. These units range from 20 kw. to 68 kw. capacity. An increasing activity in industrial heating is reported by the Boston Edison company, and another company reports many inquiries for furnaces. The sale of small motors has decreased a little during the past week. One manufacturer reports that his present sales are more than 40 per cent ahead of 1924 for the same period. A fair steady demand for electrical supplies is noted by jobbers. Wire is selling well and iron conduit continues to move in good volume, owing to the gradual opening up of outside spring construction. Circuit breakers and switches are in good demand; several agents for electrical indicating and recording instruments report a growing interest in this line. Appliance sales throughout the district are at a low ebb in general, but good sales are reported in certain localities. For the week ended March 14, 1925, merchandise sales reported by one group of central-station plants amounted to $14,206, as compared with $10,202 for the preceding week, an increase of more than 50 per cent for the entire period to date as compared with this same period in 1924.

Industrial Buying on Pacific Coast in Good Volume

POWER companies, railroads and industrials are buying well on the Pacific Coast. Some orders placed include ten carloads of 35-ft. and 45-ft. poles, one carload of guy strand and several twenty-five-piece to one hundred-piece assortments of grips, clamps, pike poles and other construction tools. The volume of electrical business derived from industrials was considered very good and in addition to wiring material orders and inquiries included from 400 to 1,000 reflectors each for several factories, 3,000 heater switches, 1,000 special snap switches, $2,000 worth of No. 4 varnished cambric cable for 7,000 volts and several hundred pounds of sheet fiber.

Contracting business is rather slow, but the number of large buildings and small residences projected insures a large and varied volume before midyear. Twenty schools are soon to be built in the Bay district, including several technical schools which require a high percentage of electrical equipment. Dealers find radio business good, but appliance customers are inclined to postpone immediate purchase. Country business is very quiet and contractors in the interior cities are working at as low as one-half capacity. Recent frosts have damaged the grape and apricot crops. Business is generally conceded to be lighter than had been predicted for this month. Dealers have received a larger discount on electric ranges, with the result that there is an encouraging and increased movement to the district dealer, whose co-operation will help to produce very good range business.

Activities of the Trade

Copeland Products Elects New Officers

At a meeting of the new board of directors of the Copeland Products, Inc., Flint, Mich., held in Detroit, William Robert Wilson, a director of the Bank of Detroit and recently president of the Maxwell Motor Corporation, was elected president. Other officers elected at the directors' meeting were E. H. Brown, vice-president and treasurer, and E. J. Copeland, vice-president and secretary. Mr. Copeland was one of the founders of the Kelvinator Corporation, Detroit, and its former president and general manager.

Charles A. Floyd & Company of the Dime Bank Building, fiscal agents for Copeland Products, Inc., states that a group of well-known Detroit men have just invested substantially in the corporation and that the increased capital will permit the company's availing itself of the much larger market its product has been developing. The present output will be substantially increased at once and manufacturing facilities which are now established at Flint may be moved to Detroit in order to secure increased capacity quickly.

Western Electric Company Issues Annual Report

The annual report of the Western Electric Company states that sales in 1924 amounted to $298,281,000, the largest volume of business ever attained by the company for any year. They were 7.4 per cent greater than had been estimated at the beginning of 1924 and compare with total sales of $255,177,000 for 1923. The sales of the company include merchandise not of Western Electric manufacture which the company procures for and furnishes to telephone companies as their purchasing agent and storekeeper. The sales to other domestic consumers showed a decrease of 7.6 per cent and to Bell Telephone Companies an increase of 25 per cent.

Unfilled orders of the company on December 31 aggregated $92,014,000 as compared with $94,951,000 at the end of 1923 and $62,069,000 at the end of 1922. A careful study of the prospects for 1925, according to the report submitted by Charles G. Du Bois, president, indicates that the total volume of business will be less than in the high record year of 1924, but probably not less than in 1923, which was the previous high record.

Central-Station Men at the Nela School of Lighting

A group of fifty-seven representatives of the Public Service Company of Northern Illinois took a special course in illumination recently at the Nela School of Lighting at the National Lamp Works of the General Electric Company, Cleveland. A comprehensive study was made of the principles of illumination and their application in all fields. This is the first time that any central-station company has sent as large a delegation as this to Nela Park for a special course of instruction in lighting, and it is indicative of the increasing interest on the part of power companies in providing their customers with the most up-to-date information and the best service in lighting.

W. N. Matthews Holds Annual Meeting and Elects Officers

The annual meeting of the stockholders of the W. N. Matthews Corporation, manufacturers of electrical specialties and mechanical painting equipment, was held at the office of the corporation in St. Louis on March 3. The following directors were elected for the ensuing year: W. N. Matthews, Claude L. Matthews, James R. Kearney, M. C. Cooley and C. C. Fredericks.

At the annual meeting of the board of directors, held on March 11, the following officers were elected: W. N. Matthews, president; Claude L. Matthews, vice-president and treasurer; James R. Kearney, vice-president and manager of electrical sales, and M. C. Cooley, secretary. C. C. Fredericks, formerly vice-president and general manager of the corporation, left the employment of the company on March 11. The corporation announces that its affairs were never in better condition and that it looks forward to a very good business for the rest of the year.

United Electric Announces Several Organization Changes

The following changes in organization have been announced by the United Electric Company, Canton, Ohio, manufacturer of stationary and portable electric cleaners. Kenneth S. Clarke, formerly general manager of Altorfer Brothers, Peoria, Ill., has been appointed vice-president and general manager. E. H. Hesslink has been made a special field sales representative of the portable division. P. V. Neuenschwander, previously associated with the Eureka Vacuum Cleaner Company, has been made district manager at Cleveland, Ohio. A. C. Ahrens, formerly associated with the Electric Vacuum Cleaner Company, the Apex Electrical Distributing Company and the United Electric Company, has been appointed district manager for the Southeast division, comprising the states of South Carolina, Georgia, Florida and Alabama.

Other appointments include G. R. Graham as district manager for the Eastern Ohio-Northwest Pennsylvania district and James J. Buchman as district manager for the Michigan-Northwest Ohio district. W. C. Wicker and H. G. Phister have also both been appointed to executive posts connected with sales.

Northwestern Manufacturing Makes Organization Changes

At the annual meeting of the stockholders of the Northwestern Manufacturing Company, Milwaukee, manufacturer of motors, dynamos from ¼ hp. to 200 hp. and special electrical machinery, Mrs. Mary E. Harper, Mrs. William Stark Smith, J. Fletcher Harper and William Stark Smith sold the controlling interest of the company held by them to Frederick W. Ells and Walter J. Aitken, who for many years have been associated with the company.

Mr. Smith will retire from active management of the company, but Mr. Smith and Mr. Harper will both be connected with it as directors and will retain large financial interests. The new officers of the company are: Frederick W. Ells, president; J. Fletcher Harper, vice-president, and Walter J. Aitken, secretary and treasurer.

Simplex Wire & Cable to Erect Administration Building

The Simplex Wire & Cable Company has awarded a contract to Stone & Webster, Inc., Boston, for the construction of an addition to its plant at Sidney and Auburn Streets, Cambridge, Mass. The new building will be four stories high, with basement 80 ft. x 100 ft. It will be utilized for administration offices and will also contain a chemical laboratory and machine shop. The estimated cost is about $112,000.

The Riley Stoker Corporation has appointed the Mine & Smelter Supply Company, Denver, and Salt Lake City, Utah, as its representative in a part of the Rocky Mountain district.

The Haag Brothers Company, Peoria, Ill., manufacturer of electric washing machines, has started work on a thirty-thousand-dollar factory, which will be added to the East Peoria plant of the company. The new unit is necessary to maintain production schedules in line with the growing business of the company, which has been constantly extending its sales field.

The Ideal Electric & Manufacturing Company, Mansfield, Ohio, manufacturer of direct-current and alternating-current power apparatus, announces the opening of its Boston office at 120 High Street, room 306, under the management of G. W. Conner.

The Manhattan Electrical Supply Company, Inc., 17 Park Place, New York, announces the appointment of Arthur J. Selzer as manager of the New York branch house. Mr. Selzer for the last five years has been director of sales of the B-R Electric Company, Kansas City. The company also announces the appointment of W. R. Davis as manager of the St. Louis branch house. Mr. Davis for more than five years has been general sales manager of the Magnavox Company.

The Delco-Light Company, Dayton, Ohio, announces the production of a new model D-5 "Frigidaire," which is a standard "Frigidaire" complete in every detail and built to fill the need for dependable electric refrigeration at a low price. The unit retails for $245 f.o.b.

Dayton and is complete with a cabinet ready to install. The outfit is self-contained, the compressor unit being mounted in a compartment at the bottom of the cabinet.

The Crocker - Wheeler Company, Ampere, N. J., announces that it is now building two turbine-driven 625-kva., 2,300-volt, three-phase, 60-cycle, 3,600 r.p.m. generators for St. Elizabeth's Hospital, Washington, D. C. These generators will be driven by Moore steam turbines manufactured by the Moore Steam Turbine Corporation, Wellsville, N. Y. The Crocker-Wheeler Company states that it is now prepared to offer to the trade turbine-driven alternating-current generators up to 1,875 kva. at 3,600 r.p.m.

The New England Electric Credit Association, Charles A. Kane secretary, announces the removal of its office to 176 Federal Street, Boston.

The Westinghouse Electric & Manufacturing Company announces the receipt of an order from the War Department for switchboards, regulators and accessories to control and distribute electricity purchased from commercial sources for the entire electrical requirements of Forts Warren and Strong in Boston Harbor. The present individual generating plants which are now supplying these forts with electricity will be shut down and held in reserve.

The Cowan Truck Company, Holyoke, Mass., announces the appointment of Tuttle & McCord, 1000 Marietta Street, Atlanta, as its Georgia representative.

J. T. Fulwiler, Atlanta Trust Company Building, Atlanta, manufacturers' sales representative, announces that he now has associated with him C. W. Chapman, formerly city salesman for the Western Electric Company, New Orleans, La. Mr. Chapman has been associated with the electrical industry for a number of years and is well known throughout the South. The firm name of the company in the future will be Fulwiler & Chapman.

The Bryan-Marsh Division of the National Lamp Works of the General Electric Company announces that its new York City division will be moved from 4618 Grand Central Terminal Building to the Postum Building, 250 Park Avenue, New York City, on April 1.

The General Electric Company has awarded a general contract for a one-story addition to its local plant at East Lake Road, Erie, Pa. It will be 100 ft. x 200 ft., estimated to cost $50,000.

The Gainaday Electric Company, Pittsburgh, manufacturer of household labor-saving appliances, announces that it has now placed on the market the "New Gainaday" washer, which is said to involve a new idea.

The Wollmar Engineering Corporation, 224 East Forty-second Street, New York, announces the appointment of A. J. Gillespie as sales representative at the Cleveland office for "N.K.A." ball and disk bearings, with headquarters at 8500 Lake Avenue. Mr. Gillespie for the last three years has been president of the A. J. Gillespie Company, specializing in ball and roller bearings, and previous to that was district manager for the Hess-Bright and SKF companies.

New Equipment Available

Ball Bearings

A new ball bearing of the deep-groove type without filling slots, known as the "Super-Strom," has been placed on the market by the Strom Ball Bearing Manufacturing Company, 4587 Palmer Street, Chicago. This bearing is said to offer increased load-carrying capacities owing to the use of more or larger balls, according to the size of the bearing. The nominal outside dimensions are the same as those of the international standard sizes for light, medium and heavy duty, so that "Super-Strom" bearings are interchangeable with ball bearings of standard dimensions.

Induction Motor

An automatic self-starting induction motor has been placed on the market by the United States Electrical Manufacturing Company, 200 East Slauson Avenue, Los Angeles. The "U. S. automatic-start motor," as it is called, is a simple squirrel-cage motor with an improved squirrel-cage rotor of the double-winding type so designed that when the current is first thrown on it is carried in part of the cage until the motor attains its speed. At this point through inductive action the complete squirrel cage takes the load. A simple switch is used to close the electrical circuit when the motor automatically comes up to full speed with an available starting torque higher than is obtained in the ordinary type of squirrel-cage motor. The efficiency and power factor of this motor is normal for motors of the squirrel-cage type. The starting current taken is said to be less than the limit set by the National Electric Light Association.

Automatic Starter

A direct-current automatic starter provided with time-limit acceleration and known as the class 7107 has been placed on the market by the Industrial Controller Company, Milwaukee. The starter is of the remote-control type with low-voltage protection and overload protection, if desired. The contact fingers are of the sliding "butt" type with helical springs to insure proper contact pressure. The short-circuiting bar makes direct contact with the fingers without the use of cams or toggles. A powerful magnetic blow-out provided on the first contact finger makes this starter available for "inching" or "jogging" service.

The resistor units provided with this starter are of the enamel type and are mounted on the face of the panel above the accelerating mechanism. The mechanism and resistor are mounted on an ebony asbestos panel which as a unit may be removed from the cabinet. This line of starters is designed to have the same mounting dimensions as the alternating-current automatic starter of the company known as the class 8527 and is particularly suitable for mounting on small machine tools, pumps, etc. It is available in sizes up to and including 5 hp.

Insulated Tree Trimmer

An insulated tree trimmer for use around high voltage has been placed on the market by the Bartlett Manufacturing Company, 446 East Lafayette Avenue, Detroit. An insulator ½ in. in diameter and 30 in. long connects the pull lever with the operating head, and by having these on opposite sides of the pole the tendency is to keep the pole straight and stiff. The trimmer is provided with a compound lever head which insures easy cutting qualities. It is said that a limb 1¼ in. in diameter may be cut with ease. A rope attached to a wooden pull lever is placed near the top of the pole. The trimmer is supplied in lengths 16 ft. or shorter, if desired.

Switch Interlocks

A series of switch interlocks known as the "Robinson" interlocks have been developed by Charles Cory & Son, Inc., 183 Varick Street, New York City, for preventing the accidental opening of disconnecting switches while under load. With the Robinson system of interlocking the only means of unlocking the doors and switches of a particular power circuit is by means of a key retained in the master interlocking unit for the circuit, known as the switch interlock No. B-986. In this switch interlock one set of contact blades of the snap switch is connected in series with the control circuit of the oil-switch closing relay.

The "Robinson" cell-door interlock, No. B-857, is used for locking doors individually or in groups so that doors over switches in all phases of a circuit can be under the control of one lock. Several different types of mounting plates and bolt eyes used in flush mounting are available.

The disconnecting switch interlocks Nos. B-927 and B-1010 make it possible to lock the operating mechanism of group-operated "disconnects" in either the closed or the open position. These interlocks connect directly to the switch-operating mechanism by cranks and connecting rods. Yale locks are used with all interlocking mechanisms.

Farm Utility Motor. — A complete farm utility motor unit consisting of an electric motor with belt tightener, inclosed type push button control and a countershaft carrying four driving pulleys of different sizes, all mounted on a four-wheel truck, has been placed on the market by the General Electric Company. This provides four possible driving speeds for every driven machine. The start and stop push button is located at the end of a control cable of sufficient length to reach the driven machine.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Stockholm, Sweden (No. 14,148), for electrical pharmaceutical supplies.

An agency is desired in Cairo, Egypt (No. 14,155), for various kinds of electrical supplies.

An agency is desired in Sydney, Australia (No. 14,175), for fractional-horsepower measuring instruments, fans and wiring devices, automatic telephones and equipment and electrical glassware.

Purchase is desired in Alexandria, Egypt (No. 14,176), of radio apparatus.

Purchase is desired in Teneriffe, Canary Islands, (No. 14,126), of radio broadcasting apparatus and equipment.

Purchase and agency are desired in Winnipeg, Canada (No. 14,205), for radio sets and parts, such as loud speakers, phonograph units and battery eliminators.

Purchase is desired in Stuttgart, Germany (No. 14,136), of electric typewriters.

Purchase is desired in Amsterdam, Netherlands (No. 14,193), of washing machines.

ELECTRIC MOTORS FOR NEW ZEALAND GOVERNMENT RAILWAYS. — Tenders will be received by the Government Railway Department, Wellington, New Zealand, until April 28 for sixty-five alternating-current motors for the government railways.

New Trade Literature

TRANSFORMERS.—Bulletin No. 2,041 issued by the Pittsburgh Transformer Company, Pittsburgh, calls attention to some additional advantages of the Pittsburgh polyphase transformers.

FANS.—"The Fan with 38 Features" is the title of a booklet distributed by the Wagner Electric Company, 6400 Plymouth Avenue, St. Louis, covering the Wagner fans.

AUTOMATIC SWITCHING EQUIPMENT.—A leaflet issued by the General Electric Company, Schenectady, N. Y., describes its motor-operated timer, type "Md-2," for controlling the operation of oil circuit breakers in alternating-current reclosing service.

FANS AND BLOWERS.—Bulletin No. 1,801 issued by the American Blower Company, Detroit, describes and illustrates the American "Sirocco" fans and blowers. It contains instructions for installing the fans and tables showing the capacity of various types of the "Sirocco" fan. The company is also distributing a leaflet covering its "ABC" air washing and cooling fan for providing cleansed and purified air.

FUSES.—The Trico Fuse Manufacturing Company, Milwaukee, is distributing a folder calling attention to the Trico "Kantark" non-renewable fuses.

WELDING ELECTRODES.—The General Electric Company, Schenectady, N. Y., has issued a booklet entitled "G. E. Welding Electrodes," describing the characteristics and applications of the three types of its electrodes designated as A, B and C.

BRASS PRODUCTS.—The Bridgeport Brass Company, Bridgeport, Conn., has issued a new data book No. 16 containing prices and weights of sheet brass, brass rod, wire, condenser tubes and seamless brass and copper tubes.

ENGINEERING DATA.—"Engineering Data from Aërial Views" is the title of bulletin No. 1 issued by Brock & Weymouth, Inc., 1607 Walnut Street, Philadelphia, which outlines the Brock process of producing topographic maps for engineering purposes. The apparatus is also illustrated and described.

POLE-LINE EQUIPMENT.—The American Jobbers' Supply Company, 1502 Woolworth Building, New York City, has issued catalog No. 9, covering its products for electrical construction work. It is cloth-bound and contains 244 pages, giving a complete list of pole-line construction material and useful information for those interested in building transmission lines and telephone lines. Ninety-three pages are devoted to the insulator section; dimensioned drawings are included as well as full data covering the various types of insulators.

WATTLESS COMPONENT METERS.—Landis & Gyr, Ltd., Zug, Switzerland, have issued bulletin TB2403d on their wattless or reactive component meters for single and polyphase circuits. The bulletin covers its types CDϕ, for single-phase circuits; type FBϕ, for three-phase, three-wire circuits with unbalanced loads; type MBϕ for three-phase, four-wire circuits with unbalanced loads; types EBϕ for three-phase balanced-load circuits, and types KBϕ and LBϕ for two-phase circuits. L. H. Junod & Company, 104 Fifth Avenue, New York City, are sole agents for the United States.

ILLUMINATING ENGINEERING DATA.—The Holophane Glass Company, Inc., 342 Madison Avenue, New York City, has issued a new edition of the "Holophane Datalog." This publication is a combination data book and catalog and includes several new developments brought out by the company during the last year, including the No. 944, 200-watt window reflector, No. 980 watchman circuit lighting unit and C-2172 corridor-lighting unit.

POTHEADS. — The G. & W. Electric Specialty Company, 7440 South Chicago Avenue, Chicago, is distributing a supplementary leaflet to catalog No. 12 covering the "G. & W." single conductor potheads with capnut terminal.

ELECTRICAL CONTROL.—The Sundh Electrical Control for High-Grade Buildings" is the title of a bulletin issued by the Sundh Electric Company, Inc., 5 Avenue C, Newark, N. J., in which it describes the various types of the Sundh electric control, including manual starters, automatic house-pump controllers and automatic compression system for either water supply or compressed-air and automatic refrigeration systems.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

AUBURN, ME.—The City Council will soon award a contract for a fire-alarm signal headquarters, to cost about $20,000.

LEWISTON, ME. — Extensions to its plant and transmission lines, to cost about $200,000, are under consideration by the Androscoggin Electric Company.

MANCHESTER, N. H. — Contract has been awarded by the Manchester Traction, Light & Power Company to Stone & Webster, Inc., Boston, for enlarging the boiler house at its steam plant at Kelly Falls. The work will include an addition to the building, installation of a 1,495-hp. boiler with feed-water heater and auxiliaries.

MONTAGUE, MASS. — The Board of Selectmen are considering establishing a municipal electric light plant.

RUTLAND, MASS.—Bids will be received by the Construction Division, United States Veterans' Bureau, Washington, D. C., until March 31, for an automatic telephone system at local hospital No. 89.

Middle Atlantic States

BROOKLYN, N. Y. — Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 7, for a quantity of magnet wire for the South Brooklyn navy yard, and for 25,000 ft. ignition cable, for the Mare Island navy yard (Schedule 3478).

CORNING, N. Y.—Plans are under way by the Lamoka Electric Power Corporation, for an electric power project between Lakes Keuka and Lamoka. The cost is estimated at about $5,000,000 and will include the construction of a dam at Bradford and a power house at Lake Keuka, to develop from 25,000 to 40,000 hp. The officers are: John Mills, Sodus, president, O. C. W. Mills, Sodus, vice-president, and G. F. Showers, Corning, secretary and treasurer.

DOBBS FERRY, N. Y.—Plans for the proposed local printing plant of the Methodist Book Concern, 150 Fifth Avenue, New York, to cost about $500,000 include a power house. Electric power equipment will be installed in the factory. Visscher & Burley, 363 Lexington Avenue, New York, are architects and engineers.

JAMESTOWN, N. Y.—A campaign has been started by the Board of Public Utilities for the installation of an ornamental lighting system in the business sections of the city. An ordinance has been approved by the Council providing for the expense of the installation to be paid by property owners and the maintenance to be borne by the city.

LONG ISLAND CITY, N. Y.—The Ronzoni Macaroni Company, 612 Jackson Avenue, plans to install electric power equipment in its proposed plant at Jackson and Hulst Avenues, to cost about $350,000, for which a general contract has been let. Parker & Shaffer, 280 Madison Avenue, New York, are consulting engineers.

NEW YORK, N. Y.—The directors of the Associated Gas & Electric Company, 43 Exchange Place, New York City, have authorized an expenditure of about $2,000,000 for new construction during the early part of 1925. Of this amount approximately $1,500,000 will be expended on its properties in central New York for the erection of new transmission lines, $150,000 in eastern New York State, $150,000 in the Harlem Valley, $180,000 on the Kentucky-Tennessee properties and $120,000 on the Cape Cod properties.

NEW YORK, N. Y. — Bids will be received by the Commissioner of Public Markets, twenty-third floor, Municipal Building, until March 30 for the installation of an electric light and power system in a wholesale market and storage building and lighting system in a power house for the Bronx Terminal Market at Exterior and East 151st Streets, Borough of Bronx.

SPRINGVILLE, N. Y. — The Board of Trustees, contemplates the erection of a transmission line to Ashford for light and power service there from the municipal power plant.

STATEN ISLAND, N. Y. — Bids will be received by the superintendent of Lighthouses until April 14 for eight engine-driven generator plants, each plant 4½ kw. to 5 kw., consisting of either two or three engine-driven generator units and 112-volt storage battery.

ATLANTIC CITY, N. J. — The installation of electric traffic signals on Atlantic, Pacific and Baltic Avenues, to cost about $45,000, is under consideration by the City Commission.

MONTCLAIR, N. J.—The Public Service Electric & Gas Company, Newark, plans to construct a substation of 20,000 kva. capacity on Valley Road, near Bloomfield Avenue. A substation of same capacity will be built on Bloomfield Avenue in Bloomfield.

ASPINWALL, PA.—Bids will be received by the Construction Division, United States Veterans' Bureau, Washington, D. C., until March 31, for an automatic telephone system at the local veterans' hospital, 103.

BRACKENRIDGE, PA.—The installation of a fire-alarm telegraph system throughout the city is under consideration by the City Council.

BROOKVILLE, PA. — Bonds to the amount of $100,000, have been voted to acquire the local electric light and power plant of the Solar Electric Company, to be owned and operated by the municipality. Improvements will be made in the plant.

HARRISBURG, PA.—Extensions and improvements are contemplated by the Harrisburg Light & Power Company to cost about $700,000, to include an addition to its power plant on Cedar Street, and installation of a 10,000-hp. turbo-generator unit increasing the output to 35,000 hp. It is also proposed to install additional equipment at the power house on Ninth Street.

PHILADELPHIA, PA.—The Fifty-second Street Allied Business Association has petitioned the City Council for the installation of a new street-lighting system on that thoroughfare.

ROCKWOOD, PA.—The City Council has been authorized by the Public Service Commission to acquire the system of the Rockwood Electric Company to be owned and operated by the municipality. Improvements are planned.

ROUSEVILLE, PA. — The Rouseville Light & Power Company is being organized to supply light, heat and power here. C. A. McClure and George W. Crowley are interested in the company.

SALINA, PA. — The Citizens' Light & Power Company, Oil City, contemplates erecting a transmission line from Seneca to Salina.

SAXTON, PA.—The Penn Central Light & Power Company, Altoona, contemplates the construction of a switching and distributing station at its local generating plant, to cost about $250,000.

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, until April 20, for 10,400 switchboard connecting plugs (Proposal C.P. 20452-1).

WASHINGTON, D. C.—Bids will be received by the Board of Commissioners, District of Columbia, until March 31, for cast iron and glass fixtures and fittings for tops of street lamp posts.

WASHINGTON, D. C.—Bids will soon be asked by the Bureau of Yards and Docks, Navy Department, Washington, for equipment for power plant at the local naval hospital, including one motor-driven forced-draft fan, one turbine-driven forced-draft fan, four 300-hp. water-tube boilers and mechanical stokers (Specification 5082).

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, until March 31, for 1,000 ft. single-conductor cable for the Portsmouth, N. H., navy yard; 6,000 ft. lead-sheathed cable for the Washington yard; 5,000 ft. lead-covered cable for the Annapolis (Md.) yard; 50,000 ft. lamp cord, and 90,000 ft. lighting and power wire for the Mare Island navy yard; and 6,000 ft. lamp cord for the San Diego, Cal. yard (Schedule 3477).

North Central States

CHARLOTTE, MICH. — The Detroit (Mich.) Edison Company has preliminary plans for a 7,200-kw. substation, to cost about $350,000 to replace the present station here.

DETROIT, MICH.—Plans are being prepared by the Detroit Edison Company for the construction of a substation on Beaubien Street near Madison Avenue, for direct-current service, to cost about $1,400,000, with connecting conduit and cable lines. It will have an initial capacity of 4,800 kw. and an ultimate output of 12,000 kw.

IRON RIVER, MICH.—The City Council is considering the purchase of motors and other electric power equipment for the municipal waterworks.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until April 3 for forced-draft fans and combustion control equipment for the Divisions of Water and Heat and Light and Power.

CLEVELAND, OHIO.—Separate bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until April 3 as follows: For subway and pole-type constant-current regulators and traveling coal larry for the Division of Light and Power.

CLEVELAND HEIGHTS, OHIO.—Plans are being prepared by Morris & Weinberg, 3608 Euclid Avenue, Cleveland, for a group of buildings for the Jewish Orphan Home, care of E. Joseph, 705 Union Trust Building, Cleveland, to include administration, chapel, power house, service and garage buildings, fourteen cottages, etc., to be erected on Fairmount Road, east of Belvoir Boulevard.

OXFORD, OHIO.—The City Council has entered into a contract with the Union Gas & Electric Company, Cincinnati, to furnish electricity to the town. Under the terms of the contract the village is to provide the location for the substation.

ZANESVILLE, OHIO. — The Columbus, Newark & Zanesville Electric Railway Company plans to build a substation on Linden Avenue, to cost about $40,000.

SOUTH BEND, IND.—The Indiana & Michigan Electric Company has been granted permission to take over the Twin Branch Power Company, Mishawaka, and to make extensions in transmission lines.

ALTAMONT, ILL.—Bids will be received by J. E. Rhodes, Mayor, until April 6 for furnishing and installing an ornamental lighting system and street intersection traffic guide (mushroom) fixtures for the city of Altamont. The plans call for ninety-two ornamental standards mounted with single lamps and twelve street-inter-section guide-lamp fixtures, etc. For details see Searchlight Section. The W. A. Fuller Company, Railway Exchange Building, St. Louis, is engineer.

BROCKTON, ILL.—Extensions are contemplated to the municipal electric plant, including the installation of a 25-hp. oil engine and a 20-kva. generator, during 1925. A twenty-four-hour service may be established. Paul V. Deames is treasurer.

CHICAGO, ILL. — The Victor X-Ray Company, 236 South Robey Street, contemplates the installation of electric power equipment in its proposed plant, at Jackson Boulevard and Seeley Street, to cost about $300,000. S. N. Crowen, 10 South LaSalle Street, is architect.

COWDEN, ILL.—Improvements are contemplated to the municipal electric plant during 1925, including a new generating unit. H. V. Jones is village clerk.

KANKAKEE, ILL.—The Federal Ice & Refrigerating Company plans to install electric power equipment in its proposed ice-manufacturing plant, to cost about $300,000. Charles C. Coneby is company engineer.

LAKE VILLA, ILL. — Application has been made to the Commerce Commission by the Public Service Company of Northern Illinois, Chicago, for permission to make extensions to its electric distribution system in Lake Villa Township and on Hickory Road and on Loon Laek Melburn Road.

BLANCHARDVILLE, WIS.—The Village Board has voted in favor of selling the municipal electric distribution system to the Wisconsin Power & Light Company, Madison, subject to the approval of the voters. If approved, the company will extend its transmission line here and install a new alternating-current distribution system and a new street-lighting system.

KAUKAUNA, WIS. — Plans are being prepared by the Green Bay & Mississippi Canal Company, Insurance Building, Appleton, for the construction of a hydro-electric plant, dam, etc., at Rapid de Croche, 4 miles north of here, to cost about $500,000.

LA CROSSE, WIS. — Plans have been adopted by the Northern States Power Company, Eau Claire, for the construction of a 6,700-hp. electric generating unit at its local properties.

MILWAUKEE, WIS. — The Milwaukee Electric Railway & Electric Light Company contemplates extending its street car and interurban lines from Thirty-fifth and Clybourn Streets across the Menominee Valley on a viaduct to West Allis, at a cost of about $700,000.

RACINE, WIS.—Plans are under consideration by the City Council for extending the ornamental lighting system on North Main Street from Gold Street to the city limits.

ST. CROIX FALLS, WIS.—Plans are being considered by the Northern States Power Company, Chicago, for the construction of two new power plants near St. Croix Falls, to cost about $10,000,000.

WISCONSIN RAPIDS, WIS.—Bids will be received by C. P. Cross, manager, City Water Supply, until April 14 for construction of filtration plant, including building, two low lift centrifugal pumps, motors and starters, lighting, switch cabinet, conduits, outlets, wiring fuses and switches, heating system, chemical feed machine, etc. W. G. Kirchoffer, 22 North Carroll Street, Madison, is engineer.

FAIRMONT, MINN. — Bids will be received by H. J. Waite, secretary of Board of Water and Light Commissioners, City Hall, until March 31 for furnishing and installing light, power and heating equipment as follows: (1) General conditions applying to all sections of the work; (2) boilers, superheaters and breeching, including brick settings; (3) automatic stokers.

FARIBAULT, MINN.—During the coming summer the Northern States Power Company, Chicago, plans to erect a new transmission line between Faribault and Mankato. The line between Waterville and Waseca will also be rebuilt, and a new substation will be erected in Farmington.

DUBUQUE, IOWA.—The Utilities Power & Light Corporation, 327 South La Salle Street, Chicago, has applied for permission to erect a high-tension transmission line across the Mississippi River at Dubuque.

POPLAR BLUFF, MO.—The Black River Power & Development Company, recently organized, has applied to the Federal Power Commission for a preliminary permit to build a large hydro-electric power plant on the Black River above Leeper. The cost of the project is estimated at about $3,500,000. R. I. Randolph, 38 South Dearborn Street, Chicago, is engineer. W. H. Meredith, Poplar Bluff, is interested in the company.

DICKINSON, N. D. — The Hughes & Deiters Company contemplates the erection of a transmission line from Dickinson to furnish service at Gladstone, Richardson, Hazen and Taylor. It also plans to install additional equipment at its power plant. The cost is estimated at $100,000.

MITCHELL, S. D. — The Northwestern States Power Company plans to erect a transmission line from here to Ethan.

CHADRON, NEB.—Tentative plans are under consideration by the Western Public Service Company, Colorado Springs, Col., for the erection of a transmission line between Chadron, Whitney and Crawford. Should the plan be carried out electricity for the three cities would be furnished from Chadron.

LOUP CITY, NEB. — The Loup City Light & Power Company plans to build a transmission line to Scotia and Cotesfield.

NORFOLK, NEB.—The City Council will soon call a special election to vote on the proposal to issue $250,000 in bonds to establish a municipal electric light and power plant.

NORFOLK, NEB.—The city council has awarded the Nebraska Gas & Electric Company, Omaha, a contract for the installation of an ornamental lighting system on Norfolk Avenue.

Southern States

ANDREWS, N. C.—The City Council is considering a bond issue of $50,000, for extensions to the municipal electric light and power plant.

APEX, N. C.—Bids will be received by the Mayor and Board of Town Commissioners until April 15 for construction of waterworks and sewerage system, including pumping station and complete filter plant, tank and tower, 2,200-volt transmission line, motor-driven centrifugal pumps, etc. Gilbert C. White, Durham, is engineer.

CONETOE, N. C.—Bonds to the amount of $10,000 have been authorized for the installation of a municipal electric light and power system.

ANDERSON, S. C.—The installation of a municipal electric light and power plant, to cost about $50,000 is under consideration by the City Council.

PAVO, GA.—The purchase of a 50-hp. oil engine and generator for the municipal electric light plant is under consideration. R. L. Braddy is superintendent.

BARTOW, FLA.—The installation of a larger generating unit and two boilers in the municipal electric light and water plant is under consideration. J. E. Childs is city manager.

CRESCENT, FLA.—The Municipal Electric Light and Water Department contemplates the erection of a 6,600-volt transmission line to the town of Pomona, a distance of 8 miles. J. A. Dissel is superintendent.

ORANGE, FLA. — The Florida Public Service Company has acquired the local electric system. Extensions are contemplated by the Florida company including a three-mile extension on East New York Avenue to and around Lake Winnemissett for which material has been ordered. The company is also building a line to De Leon Springs.

ST. CLOUD, FLA. — Plans are under way for improvements to the municipal electric light plant and waterworks, including the drilling of a new well at once. Later in the year two new pumps will be installed and a reservoir built. M. Peterson is superintendent.

JOHNSON CITY, TENN. — Extensive improvements to cost about $600,000, are contemplated by the Tennessee Eastern Electric Company to its system, including the raising of its power dam.

DOTHAN, ALA. — The installation of coal and ash-handling machinery in the municipal electric power plant is under consideration. R. J. Goodwin is superintendent.

ABERDEEN, MISS. — The Mississippi Power Company, Gulfport, which recently acquired the municipal electric plant, has authorized the erection of a transmission line to supply service here.

BENTONVILLE, ARK.—Plans are being considered to extend the transmission line of the municipal electric plant to supply electricity in Centerton. J. C. Black is electrical engineer.

JONESBORO, ARK. — Extensions are contemplated to the municipal electric and water plant, including the construction of a new power house, installation of a 1,500-kw. turbo-generator, two 500-hp. high-pressure boilers and accessories, and also to erect a concrete stack. J. F. Christy is manager.

MOUNTAIN HOME, ARK.—Plans are under way by the Mountain Home Electric Company for improvements to its plant, including an addition to power house and the installation of a 75-hp. or 100-hp. engine-driven generating unit in May. It also contemplates the erection of line extensions, covering about 2 miles. Wyatt H. Wolf is owner and manager.

HAMMON, OKLA.—Surveys are being made by the town of Hammon for an electric distribution system and a transmission line from Hammon to Elk City, to cost about $30,000. J. D. Bomford, Elk City, is engineer.

PONCA CITY, OKLA.—The City Council plans to purchase equipment for the municipal electric plant, including a Diesel oil engine-generator set, switchboard, etc.

HOUSTON, TEX. — The Houston Structural Steel Company, Yale and Center Streets, plans to install electric power equipment in connection with proposed plant additions, to cost about $100,000, including an electric traveling crane.

Pacific and Mountain States

CENTRALIA, WASH. — The Western Cross Arm & Manufacturing Company is considering the construction of a power plant, to cost about $100,000.

SEATTLE, WASH. — The City Council has approved the installation of new lighting systems on portions of Woodlawn Avenue, Maple Leaf Place, East Green Lake Way and East Seventy-second Street.

PORTLAND, ORE. — Plans are being considered by Henry Waldo Coe, Selling Building, Portland, and associates for the construction of a 12,000-hp. hydro-electric power plant on the Toutle River, Cowlitz County, to cost about $1,000,000.

COVINA, CAL. — Plans are under way for the installation of an ornamental lighting system in the business district, to cost about $23,000. Arthur E. DeMott is city engineer.

LOS ANGELES, CAL.—Application has been made to the State Railroad Commission by the City of Los Angeles to place a valuation on the distribution systems of the Southern California Edison Company in the suburbs of the city, with a view of taking over the systems to be owned and operated by the municipality.

NEWPORT BEACH, CAL.—The Board of City Trustees is considering the installation of an ornamental lighting system on the Coast Boulevard, from Thirty-eighth Street to the city limits.

SAN FRANCISCO, CAL.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 14, for 18,000 cartridge fuses (Schedule 3490); also, at the same time for 3,800 hand flashlights (Schedule 3491).

SANTA MONICA, CAL.—The Board of Trustees is considering the installation of an ornamental lighting system on Fifth Street.

WILLITS, CAL.—The installation of a new street-lighting system with central control is under consideration by the Central Mendocino County Power Company. Edward Morris is vice-president and general manager.

NAMPA, IDAHO.—The installation of an auxiliary power unit, to cost about $24,000, is under consideration. A 190-kw. generator directly connected to a Diesel oil engine is suggested.

GLOBE, ARIZ.—The installation of a 300-hp. boiler is under consideration by the Globe Light & Power Company. W. S. Sultan is general manager.

MESA, ARIZ. — The City Council is planning extensions and improvements in the municipal electric light and power plant, to cost about $37,000.

PRESCOTT, ARIZ. — The City Council has authorized the installation of an ornamental lighting system on Washington Avenue. A. J. Kline is city engineer.

HAVRE, MONT.—Plans are under consideration by the Lighting Commissioners for the installation of an improved lighting system in Lighting District No. 1.

DOLORES, COL.—A. A. Rust, owner of the local electric plant, contemplates the installation of a 37½-kva. Fairbanks-Morse engine.

EADS, COL.—The installation of more street lamps is under consideration by the town officials. J. R. Wood is superintendent of the municipal electric plant.

GOLDEN, COL. — The Jefferson County Power & Light Company contemplates the erection of 9 miles of 11,000-volt transmission line and the erection of additional distribution lines at Indian Hills. E. A. Phinney is president and general manager.

CARLSBAD, N. M.—The Public Utilities Company is now installing a 120-hp. Worthington water turbine directly connected to a 100-kva. Westinghouse vertical 2,400-volt, three-phase generator in its plant on the Pecos River. E. A. Roberts is manager.

Electrical Patents

Announced by U. S. Patent Office

(Issued March 3, 1925)

1,528,032. SELECTIVE SIGNALING SYSTEM; S. A. Staege, Pittsburgh, Pa. App. filed Jan. 14, 1921. Signals transmitted by means of changes in the amplitude of high-frequency carrier waves.

1,528,045. AUTOMATIC TRANSFER SWITCHING SYSTEM; C. A. Butcher, Wilkinsburg, Pa. App. filed Jan. 8, 1921. For high-tension supply circuits.

1,528,047. WIRELESS TELEPHONE SYSTEM; F. Conrad, Pittsburgh, Pa. App. March 15, 1922.

1,528,050. RESTAURANT WAFFLE IRON; F. F. Forshee, Flint, Mich. App. filed Aug. 22, 1922.

1,528,053. TEMPERATURE-CONTROL SYSTEM; H. A. Hands, Swissvale, Pa. App. filed July 11, 1922. For electrically heated furnaces and appliances.

1,528,054. RECTIFIER; I. B. Harris, E. B. Harris and W. L. Harris, Kansas City, Mo. App. filed March 24, 1922. Consisting of an inclosing bulb with a cathode and an anode.

1,528,064. CURRENT COLLECTOR FOR VEHICLES; E. D. Lynch, Wilkinsburg, Pa. App. filed Nov. 2, 1921. Of the trolley type, employed in conducting current from a pair of trolley wires.

1,528,071. SELECTIVE TRANSFER SWITCH; C. McL. Moss, Pittsburgh, Pa., and F. M. Billhimer, Wilkinsburg, Pa. App. filed June 3, 1921. For automatic system.

1,528,076. STANDARD CELL; C. J. Rodman, Wilkinsburg, Pa., and T. Spooner, Edgewood Park, Pa. App. filed April 25, 1921.

1,528,079. PANTOGRAPH; W. Schaake, Pittsburgh, Pa. App. filed April 25, 1924. For electric railway vehicles.

1,528,091. DRY BATTERY; D. W. Tyrrell, Madison, Wis. App. filed June 6, 1923. With a plurality of cells.

1,528,184. CONTROLLING DEVICE FOR ELECTRICALLY HEATED UTENSILS; C. G. Coughlan, New Britain, Conn. App. filed May 29, 1919.

1,528,199. CIRCUIT BREAKER; W. S. Evans, Duluth, Minn. App. filed Jan. 16, 1922. Combination fuse and automatic circuit breaker for a multiple electric circuit.

1,528,205, 1,528,207. METALLURGICAL PROCESS; W. E. Greenawalt, Denver, Col. App. filed April 2, 1923. For the extraction of copper from its ores, especially those containing precious and other metals.

1,528,208. ELECTROLYTIC APPARATUS; W. E. Greenawalt, Denver, Col. App. filed April 7, 1923. For the precipitation of copper and the regeneration of ferric salts in leach solutions.

1,528,209. METALLURGICAL PROCESS; W. E. Greenawalt, Denver, Col. App. filed Sept. 21, 1923. For extraction of metals, especially copper.

1,528,210. SYSTEM OF SOUND-WAVE TRANSMISSION FOR CONSTANT-PITCH CONTROL; J. H. Hammond, Jr., Gloucester, Mass. App. filed June 3, 1918.

1,528,221. ELECTRIC METER; A. J. Lush, Cambridge, Mass. App. filed Feb. 19, 1920. Of the single-pivot type.

1,528,234. ELECTRIC SWITCH MECHANISM; E. Zaragoza, Manila, Philippine Islands. App. filed Nov. 29, 1921. Electromagnet and vibrator arranged to perform the functions of a circuit breaker, a circuit closer, a vibrator, a current limiter, a relay or a repeater.

1,528,286. AUTOMATIC RESISTANCE-CONTROL MEANS FOR ELECTRIC MOTORS; O. Winterhalter, Marysville, Kan. App. filed Dec. 6, 1921.

1,528,289. THERMOSTATIC CIRCUIT BREAKER; F. J. Cid, Quebec, Quebec, Canada. App. filed Dec. 30, 1922.

1,528,290. BATTERY CASE; Thomas R. Cook, Pittsburgh, Pa. App. filed Nov. 25, 1921. Adapted to contain two or more storage battery cells.

1,528,293. STORAGE BATTERY; K. W. Gasche, Pittsburgh, Pa. App. filed July 17, 1922. Having plates provided with ears and resting on a ledge near the top of the jar.

1,528,296. INLET BUSHING FOR ELECTRICAL DEHYDRATORS; F. W. Harris, Los Angeles, Cal. App. filed May 14, 1924.

1,528,300. HEATING AND COOLING APPARATUS; W. J. Noonan, Mansfield, Mass. App. filed May 31, 1924. Combined fan and heater unit.

1,528,317. METHOD AND APPARATUS FOR SEALING IN AND LOCATING FILAMENT MOUNTS IN BULBS; G. A. Bodem, Newark, N. J. App. filed May 26, 1923.

1,528,324. PROCESS FOR PRODUCING LAMPBLACK; C. Fischer, West Homestead, Pa. App. filed July 5, 1923.

1,528,333. HEATING FURNACE; T. M. Hunter, Newark, N. J. and C. J. Holslag, South Orange, N. J. App. filed Jan. 18, 1922. Particularly adapted for heating rivets and the like.

1,528,336. STATOR FOR ELECTRICAL TOYS; M. Latour, Sens, France. App. filed June 1, 1922.

1,528,343. AUTOMATIC TELEPHONE SYSTEM; R. G. Richardson, Chicago, Ill. App. filed Jan. 19, 1920.

1,528,362. ELECTRICAL DISTRIBUTION SYSTEM; J. R. Beard, London, England. App. filed June 4, 1924. Arrangement of switchgear at a "duplicate supply" substation connected to a high-tension network.

1,528,364. ELECTRIC WELDING APPARATUS; A. M. Brown, Mobile, Ala. App. filed April 24, 1924. Mounted on an automobile to permit the use of the automobile engine for driving the generator.

1,528,372. TROLLEY; C. A. Gouty, Bushnell, Ill. App. filed Sept. 24, 1923.

1,528,388. RESISTOR FOR ELECTRIC HEATING; C. W. Speirs, London, England. App. filed Nov. 26, 1923. Designed to have a temperature range from atmospheric to over 1,400 deg. C. and to be used for domestic, metallurgical and general manufacturing processes.

1,528,425. METALLIC ARC CUTTING AND WELDING APPARATUS; C. J. Holslag, South Orange, N. J. App. filed Sept. 20, 1920. Having a transformer provided with adjustable flux-regulating means for varying the inductive effects of the windings.

1,528,458. FUSE PLUG; W. L. Urquhart, Hartford, Conn. App. filed July 17, 1922. Indicating.

1,528,460. ELECTRICAL MEASURING INSTRUMENT; E. Weston, Hillside, N. J. App. filed June 15, 1916. Ammeter as used on automobiles, etc.

1,528,491. ELECTRICAL CONNECTING DEVICE; Knud Knudsen, Danbury, Conn. App. filed March 14, 1922. "Push-button" type.

1,528,493. HANDLE FOR VACUUM CLEANERS AND SIMILAR APPLIANCES; J. F. Lamb, New Britain, Conn. App. filed May 27, 1924.

1,528,494, 1,528,495. ELECTRIC RADIATOR; E. B. Lennig, San Francisco, Cal. App. filed Aug. 25, 1922.

1,528,496. METHOD OF MAKING RADIATORS; E. B. Lennig, San Francisco, Cal. App. filed Aug. 25, 1922. Electrically heated.

1,528,508. TERMINAL CLAMPS FOR BATTERY POSTS; F. C. Ratsch, Neillsville, Wis. App. filed April 28, 1923.

1,528,510. AUTOMATIC REGULATING APPARATUS FOR ELECTRIC FURNACES; J. Ritz, Zurich, Switzerland. App. filed Aug. 28, 1922.

1,528,542. ELECTRIC FURNACE; L. J. Hancock and T. R. Hancock, Wallington, England. App. filed Sept. 11, 1922. A series of longitudinally disposed rods of carbon or graphite surrounding a tube of refractory material, the interior of which constitutes the heating space.

1,528,580. INSULATOR PIN; A. J. Staub, Fort Wayne, Ind. App. filed Aug. 1, 1923.

1,528,596, 1,528,597. SIGNAL SYSTEM; C. E. Beach, Binghamton, N. Y. App. filed Nov. 3, 1919. Emergency system as for fire alarm, etc.

1,528,614. ELECTRICAL RECEPTACLE; Francis J. Hines, New York, N. Y. App. filed Sept. 16, 1922. Base receptacle.

1,528,625. ELECTRICAL DEVICE FOR THE CONTROL OF MECHANICAL MOVEMENTS; F. Morris, Broxbourne, England. App. filed March 14, 1924. Applicable to controllers, etc.

1,528,627. ELECTRIC TELEMETRIC DEVICE; O. S. Peters, Chevy Chase, Md. App. filed Aug. 21, 1922.

1,528,628. ELECTRIC SHOE-CLEANING AND POLISHING MACHINE; Hezekiah Powell, Kansas City, Mo. App. filed March 31, 1924.

1,528,654. PROGRAM CLOCK; P. Cancienne, Bellerose, La. App. filed April 28, 1924. As used in schools, etc.

1,528,681. LOCK-SWITCH CONNECTING PLUG; E. F. Marth, Brooklyn, N. Y. App. filed May 21, 1923.

1,528,709. TESTING-UNIT ATTACHMENT FOR FLASHLIGHTS; C. R. Trimble, New York, N. Y. App. filed May 4, 1921. For testing various circuit faults in the usual manner.

1,528,711. PROCESS FOR THE MANUFACTURE OF ELECTRICAL RESISTANCES; L. Verhaert, Paris, France. App. filed Dec. 6, 1923. Comprising a helically wound leading in wire embedded within an insulating mass of glass or similar vitreous matter.

1,528,732. TIPPED CARBON PENCIL FOR DRY CELLS; N. Dax, Dundee, Ill. App. filed June 30, 1923.

Financial and Corporate

Utility Prices Decline

Weakness in Listed Stocks Brings Selling Within Most of the Utility Groups

CONTINUATION of liquidation in the general market for listed stocks brought selling pressure within the various unlisted departments of the utility list. Virtually every important net change for the week represented a loss rather than a decline, but it should be added that the losses were not so large as might have been expected in view of the general selling of stocks. In only one or two cases did outstanding utility stocks lose more than ten points during the week.

In a general way the utility stocks have lately been holding their ground better than issues of other descriptions. The demand for power, while not increasing at the rate apparent at the best periods following election, nevertheless still is high. The time of year that power and light companies expect a seasonal slump has not arrived as yet and can scarcely be given as a reason for the tendency toward weakness. The explanation lies primarily in the condition of the general markets and the technical position of the utility market itself. Many investors have turned large paper profits into actual profits within the past month or so.

Stocks that weakened during the week to the extent of a point or two, and which may be said to represent trading for the period, were Cities Service Electric, Commonwealth Power, American Gas & Electric, Electric Investors, Inc., and United Gas & Electric. Greater losses were suffered by some other issues. Lehigh Power Securities, for example, fell off four points. Carolina Power & Light in advancing thirty-two points was an exception, but a relatively small volume of trading affects materially the prices of this issue.

Among the listed issues, American Water Works & Electric Company's stock was the feautre for strength, that issue rising to new high record levels above 48. At this price the old stock that sold last year as low as 40 would now be worth 240.

New Capital Issues

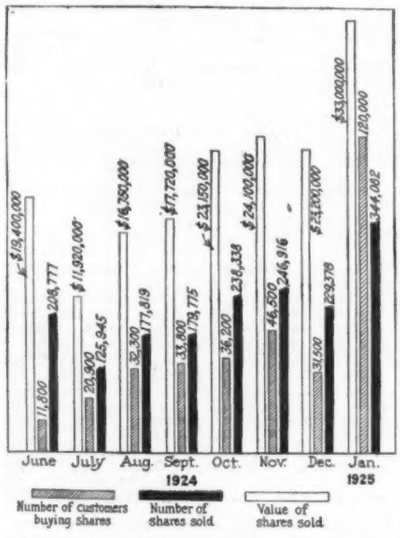
In sharp contrast with last week's activities, new issues of electric light and power securities were meager during the past week. The Oklahoma Gas & Electric Company, which only a fortnight ago floated a twenty-three-and-a-half-million-dollar loan in 5 per cent bonds, was represented this week with an eight-million-dollar issue of 6 per cent debentures, priced at 98½ and interest to yield over 6.15 per cent. The proceeds from the sale of these debentures will provide funds to retire the entire present outstanding funded debt of the company and subsidiaries.

The Cleveland Electric Illuminating Company offered 6 per cent cumulative preferred stock to the amount of $2,000,000 at 103.30 per share.

An additional offering of gold bonds of the American Public Service Company, amounting to $1,200,000, was made.

Record Sales to Customers During January

Based upon monthly reports received by the ELECTRICAL WORLD from electric light and power companies selling stock direct to customers and employees, it is estimated that during January a total of 344,082 shares were sold in this manner. The total value of this stock is estimated at $33,000,000, a record for this type of central-station financing during any one month. A total of 120,000 customers and employees purchased the stock, making an average sale to each such purchaser of $275.



LARGE INCREASE IN NUMBER OF CUSTOMERS PURCHASING STOCK

Western Electric Annual Report. — The report of the Western Electric Company, Inc., for the year 1924 shows total sales billed amounting to $298,281,000, which compares with $255,177,000. The aggregate is 7.4 per cent more than was estimated at the beginning of the year and represents the largest volume of business ever reached by the company in any year of its history. The net earnings for the year, after providing for the usual depreciation of plant and for all taxes, were $18,068,396, and the amount earned for common stock, $8,399,358, is equal to 10.7 per cent on the average book value of the common stock during the year, which was $157.65 per share. Unfilled orders on December 31, 1924, amounted to $92,014,000, as compared with $94,951,000 at the end of 1923.

Annual Reports of Light and Power Companies

The earnings statement embodied in the annual report of the Columbia Gas & Electric Company for the year 1924 showed that the combined gross earnings of all companies of the Columbia system, including those substantially less than 100 per cent owned although operated under the supervision of the Columbia Gas & Electric Company, and after elimination of all intercompany accounts, were $38,676,650 for 1924. The net earnings on the same basis, but before depreciation, amounted to $18,545,496. Compared with similar figures for 1923, such gross earnings have increased $6,197,442 and such net earnings have increased $1,397,121. Capital expenditures for additions and extensions of the properties of the Columbia system aggregated $10,113,578 in 1924. During the year cash dividends were paid to shareholders of Columbia system companies to the amount of $8,087,456. The Columbia system has a total of 144,175 electrical customers, and during the year 1924 they consumed 319,856,375 kw.-hr. of energy. In addition to this direct public service, the Columbia system also sold 55,276,010 kw.-hr. of electricity at wholesale to seven public utility companies for consumption by their respective retail markets.

The consolidated earnings statement of the Tennessee Electric Power Company for the year 1924 for the the entire system showed gross earnings of $9,570,783, as compared with $9,121,249 for the year 1923, an increase of 4.9 per cent. Net income amounted to $1,705,815 after interest and depreciation, equal after preferred dividends to $4.05 a share on the 156,000 common shares. The balance sheet as of December 31, 1924, shows current assets of $3,210,504 and current liabilities of $1,284,901, leaving net working capital of $1,925,603. The small increase over the previous year in the total of kilowatt-hours sold—396,645,812 against 386,377,391—explains the comparatively small increase in gross earnings.

Total income of the Middle West Utilities Company in 1924 was $7,473,464, compared with $6,107,721 in 1923, an increase of $1,365,743, or 22.4 per cent, according to the annual report, just issued. Surplus earnings, after payment of prior lien and preferred dividends, interest and administration expenses, were $2,916,706, or the equivalent of $14.43 per share on the outstanding common stock. This compares with $11.62 earned on the common stock in 1923 and $9.04 earned in 1922. Gross earnings of subsidiaries were $41,402,607, an increase of $5,217,425, or 14.4 per cent. To care for the rapid growth of their business the subsidiary companies expended $26,829,022 for new construction, an increase of $8,419,530 over 1923. The companies

had at the close of the year 59,165 stockholders in the aggregate, an increase of 26,487 during the fiscal period. In addition, stock had been sold at December 31, 1924, to 9,075 subscribers on the partial-payment plan.

The Niagara Falls Power Company reported for the year ended December 31, 1924, net income of $2,903,922 after charges, equal after preferred dividends to $24.38 a share (no par) on the 716,420 common shares outstanding, compared with $2,562,386, or $8.35 a share ($100 par), on the 173,244 common shares outstanding in 1923. Energy production of 2,858,482,674 kw.-hr. maintained the company's premier position among generating companies using either water-power or steam-driven generators. Fixed capital assets were increased by $4,060,551. Current assets of $5,512,193 at the end of the year exceeded current liabilities by $3,093,925. The annual report of the Consolidated Gas, Electric Light & Power Company of Baltimore showed a total gross operating revenue of $21,459,698, as compared with $21,953,136 for the previous year. After the payment of all operating expenses, taxes, fixed charges and dividends the surplus that remained was $1,043,607 less than the surplus for the year 1923. It amounted to $2,004,236. Expenditures for repairs and maintenance aggregated $1,364,634 and improvements and extensions to plants, properties and distributing systems during the year involved capital expenditures of $6,313,233. Revenue from electric sales totaled $12,995,374, representing 582,904,527 kw.-hr. At the end of the year customers numbered 142,527, as against 126,485 in 1923, an increase of 16,042, or 12.68 per cent.

The Edison Electric Illuminating Company of Boston in a comparative statement of operations for the year ended December 31, 1924, reported net operating revenue of $10,161,432, compared with $8,771,790 in 1923, and gross income of $7,736,142, against $6,520,908 for the previous year. The total connected load advanced from 538,270 kw. on December 31, 1923, to 590,774 kw. on December 31, 1924.

American Superpower's Initial Report

President Thorne Outlines Broad Purposes of the Unique Organization Created a Year Ago—Report Shows Stocks Held by Corporation

By Paul Willard Garrett

ONE of the more interesting annual reports that have appeared since the turn of the year—that of the American Superpower Corporation—does not carry an income statement. That rather unique organization was established only a little more than a year ago, and the report discusses the purpose of the management and the relation of the corporation to the power and light industry.

The American Superpower Corporation is neither an operating company nor a holding company. It is an investment company in the sense that its income is derived from its investments in a diversified list of common stocks of power and light companies. President Landon K. Thorne says in part: "Its established policy is to secure as diversified permanent investments common stocks of companies in the electric light and power business, not, however, exceeding 15 per cent of the amount of stock of any such company. It is not and never will be a holding company in the sense of seeking to exercise dominion or control over the corporate action of the companies in whose securities it invests."

While the primary purpose of the organization is to make profits for the stockholders, there are other objects that do not ordinarily appear in the creation of corporations. By bringing together men of different leading power and light enterprises the corporation serves as more or less of a clearing house for the exchange of ideas on different problems confronting the industry and is designed to help in the formation of plans for the development of interconnection of generating stations of different operators. Solution of the problems of regulation are among those that the corporation expects to help with and on which it already has done considerable work.

That the American Superpower Corporation represents a variety of interests in the industry is suggested by the names that appear among its directors. There are sixteen on the board as follows: B. C. Cobb, W. M. Flook, George E. Hardy, Frank T. Hulswitt, Alfred L. Loomis, Thomas N. McCarter, Sidney Z. Mitchell, Randal Morgan, William Spencer Murray, George Roberts, Horace S. Scarritt, Richard Schaddelee, Ray P. Stevens, Henry L. Stimson, Landon K. Thorne and Percy S. Young.

Investments as of March 1

Although the American Superpower Corporation holds no more than 15 per cent of the common stock of any particular power and light company, its most important investments are in the following companies, named in the order of their importance on Superpower's list: (1) Public Service Corporation of New Jersey; (2) Commonwealth Power Corporation; (3) Tennessee Electric Power Corporation; (4) Brooklyn Edison Company, Inc.; (5) National Power & Light Company; (6) United Light & Power Company; (7) Appalachian Power Company; (8) Republic Railway & Light Company; (9) Detroit Edison Company; (10) American Power & Light Company; (11) Southeastern Power & Light Company; (12) Edison Electric Illuminating Company of Boston; (13) American Light & Traction Company; (14) Northern Ohio Power Company. In addition it has, of course, smaller holdings in other companies.

The American Superpower Corporation is free from funded debt but has authorized four issues of stock, of which three classes are outstanding at the present time. A ten-million-dollar issue of first preferred stock of $100 par value is authorized but not outstanding. Of an authorized issue of $7,500,000 of participating preferred stock of $25 par value $3,500,000 now is outstanding. Of an authorized issue of 600,000 shares of common stock, class A, 173,000 shares are outstanding. Of an authorized issue of 750,000 of common stock, class B, 448,278 shares are outstanding.

Dividends Declared

The following quarterly dividends were announced by central-station companies and electrical manufacturing companies during the past week:

Name of Company	Per Cent	When Payable
Adirondack Power & Light, 8% pf.	2	Apr. 1
Adirondack Power & Light, 7% pf.	1¾	Apr. 1
Appalachian Power, 1st pf.	1½	May 1
Appalachian Power, pf.	1¾	Apr. 15
Arkansas Central Power, pf.	$1.75	Apr. 1
Binghamton Lt., Ht. & Pwr., pfc. pf.	$1.75	Apr. 1
California Elec. Generating, pf.	1¾	Apr. 1
Cities Service, com. (in cash)	½	May 1
Cities Service, com. (in com. stock)	½	May 1
Cities Service, pf. and pref. B (cash)	½	May 1
Cleveland Elec. Illuminating, com.	2½	June 1
Cleveland Elec. Illuminating, 6% pf.	1½	June 1
Coast Valleys Gas & Elec., pf. A	1¾	Apr. 1
Coast Valleys Gas & Elec., pf. ser. B	1¾	Apr. 1
Columbia Ry., Gas & Elec., pf.	$1.50	Apr. 1
Commonwealth Power, 6% pf.	1½	May 1
Commonwealth Power, com.	$1.50	May 1
Consumers El. Lt. & Pwr., pf.	1¾	Mar. 31
Dayton Power & Light, com.	$1	Apr. 1
Dayton Power & Light, pf.	$1.50	Apr. 1
Eastern New Jersey Power, pf.	2	Apr. 1
Electric Lt. & Pwr. of Abington & Rockland	50c	Apr. 1
Elmira Water, Lt. & R.R., 7% 1st pf.	1¾	Mar. 31
Elmira Water, Lt. & R.R., 5% 2d. pf.	1¼	Mar. 31
Fall River Electric	50c	Apr. 1
Florida Public Service, pf.	$1.75	Apr. 1
Georgia Lt., Pwr. & Rys., pf.	1¾	Apr. 1
Greenfield El. Lt. & Pwr., com.	$2.50	Mar. 31
Greenfield El. Lt. & Pwr., pf.	38c.	Mar. 31
Kings County Lighting, pf. B.	1¾	Apr. 1
Memphis Power & Light, pf.	$1.75	Apr. 1
Metropolitan Edison, pf.	$1.75	Apr. 1
Michigan Gas & Electric, pr. lien.	1¾	Apr. 15
Middle West Utilities, pf.	1¾	Apr. 15
Midland Utilities, pr. lien	1¾	Apr. 6
National Power & Light, pf.	$1.75	Apr. 1
Nevada-California Elec., pf.	1¾	May 1
New England Power, pf.	1¾	Apr. 1
New Jersey Power & Light, pf.	$1.75	Apr. 1
New Orleans Public Service, pf.	$1.75	Apr. 1
Northern Indiana Gas & Elec., pf. A	1¾	Apr. 14
Northern New York Utilities	75c	Mar. 30
Ohio River Edison, 7% pf.	1¾	Apr. 1
Pacific Gas & Electric, com.	2	Apr. 15
Pennsylvania Edison, pf.	$2	Apr. 1
Philadelphia Co., com.	$1	Apr. 30
Philadelphia Co., 6% pf.*	$1.50	May 1
Power Corp. of New York, com.	25c	Apr. 1
Puget Sound Pwr. & Lt., com.	1	Apr. 15
Puget Sound Pwr. & Lt., pr. prefer.	1¾	Apr. 15
Puget Sound Pwr. & Lt., pf.	1¾	Apr. 15
Rutland Ry., Lt. & Pwr., pf.	$1.75	Apr. 1
Southern Indiana Gas & Elec., 7% pf.	1¾	Apr. 1
Southern Wisconsin Elec., pf.	1¾	Apr. 15
Tri-City Ry. & Lt., pf.	1¾	Apr. 1
Turners Falls Power & Elec.	1¾	Mar. 31
United Gas & Electric, pf.	1¾	Apr. 1
Vermont Hydro-Electric, pf.	$1.75	Apr. 1
Virginia Railway & Power, pf.	1¼	Apr 20
Washington Water Power	2	Apr. 15
Western Power, pf.	1¾	Apr. 15
Westinghouse Elec. & Mfg., com.	$1	Apr. 30
Westinghouse Elec. & Mfg., pf.	$1	Apr. 15

* Semi-annual.

Company Reports

Among the company reports issued during the past week are the following:

Name of Company	Gross Revenues for January 1925	1924
Alabama Power*	$819,647	$741,242
Asheville Power & Light	95,247	91,874
Carolina Power & Light	309,893	224,465
Central Power & Light	372,041	313,023
Detroit Edison*	†3,106,037	†3,123,937
Havana Electric Ry., Lt. & Pwr.	1,304,165	1,208,652
Nevada-California Electric	350,917	334,092
Southern California Edison	1,813,946	1,669,043
Virginia Railway & Power*	872,359	867,230
Yadkin River Power	204,897	173,409

* February. † Includes other revenue.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stocks is $100.)

Companies	Bid Price Saturday, March 21	Low 1925	High 1925
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	100	98	102
Appalachian Power, 7 per cent	97½	92	100
Arkansas Light & Power 7 per cent	94	92	98
Asheville Power & Light 7 per cent	a 99	99	100
Central Illinois Public Service 6 per cent	87	84	92
Colorado Power 7 per cent	93	93	98
Connecticut Light & Power 7 per cent	105	105	110
Consumers' Power 6 per cent	91	90	93½
Dayton Power & Light 6 per cent	94	88	100
Duquesne Light 7 per cent	a107½	105	107½
Eastern Texas Electric 6 per cent	100	100	105
Empire District Electric 6 per cent	78	78	85
Fort Worth Power & Light 7 per cent	a101	100	102
Great Western Power 7 per cent	98½	...	...
Illinois Northern Utilities 6 per cent	88	82	92
Illinois Power & Light 7 per cent	95	92½	98
Kansas Gas & Electric 7 per cent	a 98	98	100
Long Island Lighting 7 per cent	101	100	105
Minnesota Power & Light 7 per cent	a 96	96	98
Mississippi River Power 6 per cent	90	87½	92
Nebraska Power 7 per cent	a 98	98	100
Niagara Falls Power 7 per cent—25	28½	28	29
Niagara, Lockport & Ont. Power 7 per cent	105	101½	110
Northern States Power 7 per cent	97½	95	100
Ohio Public Service 7 per cent	97	97	100
Pacific Gas & Electric 6 per cent	95	92	97
Pacific Power & Light 7 per cent	a 99	99	100
Penn-Ohio Power & Light 7 per cent	93	91	100
Pennsylvania Power & Light $7—no par	a101	100	101½
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	39½	38½	45
Southern California Edison 8 per cent	118	115	122
Tennessee Electric Power, 6 per cent	82	80	84
Texas Power & Light 7 per cent	a 99	99	101
Utah Power & Light 7 per cent	a 99	98	100
Western States Gas & Electric 7 per cent	82	82	85
Yadkin River Power, 7 per cent	a 99	98	100
Holding Companies			
American Gas & Electric 6 per cent—50	44½	44	47½
American Light & Traction	95	93	97
American Power & Light 6 per cent	87½	86	90
American Public Service 7 per cent	87	87	92
American Public Utilities 7 per cent	87	87	95
American Water Works & Electric 7 per cent	a101½	100	103
Associated Gas & Electric 7 per cent—1 per cent extra—no par	a 52	...	...
Carolina Power & Light 7 per cent	101	100	105
Central Indiana Power 7 per cent	89	88	95
Cities Service 6 per cent	81	80	83
Commonwealth Power 6 per cent	80½	80	82½
Consolidated Gas 6 per cent—50	57½	57½	58½
Continental Gas & Electric 7 per cent pr. pf.	91	89	95
Electric Bond & Share 6 per cent	102½	102	104
General Gas & Electric—$8—no par	109	104½	111
*Middle West Utilities 7 per cent	97	91½	98½
National Power & Light—$7—no par	96	95	99
North American 6 per cent—50	a 48½	46½	49
Public Service Corp. of N. J. 7 per cent	100	99	102
Public Service Corp. of N. J. 8 per cent	a110	109½	112½
Standard Gas & Electric 8 per cent—50	a 51	50½	53½
‡United Gas Improvement—50	57½	56½	58½
United Light & Power—$6.50—no par	84	83	88
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	35	31	41
Appalachian Power—no par	75	70	83
Arkansas Light & Power	75	65	85
Brooklyn Edison	a129	120½	133
Buffalo General Electric	245	197	250
Colorado Power	a 33	...	...
*Commonwealth Edison	138	134½	139
§Consolidated Gas, Electric Light & Power	34½	32	35½
Dayton Power & Light	420	180	460
Detroit Edison	a114½	110	119
|| Edison Electric Illuminating of Boston	200	200	206
Kentucky Hydro-Electric	a 79	...	...
Long Island Lighting	65	60	85
Mississippi River Power	38	37	42
Montana Power	a 66½	65½	72
Niagara Falls Power—no par	56	45½	58
Niagara, Lockport & Ontario Power—no par	63	63	73
Northern Ohio Power	6½	5	7½
Northern States Power	107	103	110
North Texas Electric	60	60	70
Pacific Gas & Electric	a106	102½	108½
‡Penn Central Light & Power—no par	64	60	64½
§Pennsylvania Water & Power	130½	126½	133½
‡Philadelphia Electric—25	39½	38½	45⅝
Public Service Co. of Northern Illinois	114	97	116
Puget Sound Power & Light	51	51	58
Southern California Edison	103	102	106
Tennessee Electric Power—no par	53	47	61
Virginia Power	65	65	92
West Penn. Co.	a115	105	120
Holding Companies			
American Gas & Electric—no par	70	70	80
American Light & Traction	145	139	153
American Power & Light	53	53	67
American Public Utilities	70	70	85
American Water Works & Electric	a 48½	34½	48½
Associated Gas & Electric, Class A	a 26½	...	...
Carolina Power & Light—no par	330	290	340
Cities Service	185	172	210
Columbia Gas & Electric—no par	a 56½	45½	59
Commonwealth Power Corp.—no par	109	106	126
Consolidated Gas—no par	a 75½	74⅜	78⅜
Continental Gas & Electric	83	80	90
Electric Power & Light	a 14	14	15½
Federal Light and Traction	a139	114½	148½
General Gas & Electric	78	72	81
Lehigh Power Securities—no par	90	82	116
*Middle West Utilities—no par	98½	82½	102½
National Power & Light—no par	217	185	230
North American—10	a 45½	41½	49
Philadelphia Co.—50	a 53	51½	57½
Power Securities—no par	13	...	...
Public Service Corp. of N. J.—no par	a 68½	67½	72½
Standard Gas & Electric—no par	a 44½	40½	47½
United Gas & Electric (Conn.)—no par	30	26	37½
Utah Securities	a 66	41⅜	69½
BONDS			
Operating Companies			
Adirondack Power & Light 6s	1950	104½	102½ 105
Alabama Power 5s	1946	97½	96 98
Appalachian Power 5s	1941	97	96 97½
Brooklyn Edison 5s	1949	99¾	99½ 100½
6s	1930	104½	104½ 105
Cleveland Electric Illuminating 5s	1939	100½	100 101½
Commonwealth Edison 5s	1943	100¾	99½ 101
5s	1953	99	98½ 99½
Consol. Gas, Elec. Lt. & Pwr. 4½s	1935	95½	95½ 96½
§6s	1949	105½	104⅜ 106½
Consumers' Power 5s	1936	99	99 99½
5s	1952	94½	90½ 95½
Detroit Edison 5s	1933	101½	99½ 102½
Duquesne Light 6s	1949	105½	104⅜ 107
Great Western Power 5s	1946	96½	95 97½
Kansas City Power & Light 5s	1952	97½	95⅜ 98½
Mississippi River Power 5s	1951	98	96½ 99
Montana Power 5s	1943	99½	97⅜ 99½
New England Power 5s	1951	100½	100¼ 101½
New York Edison 6½s	1941	113	112 115
Niagara Falls Power 5s	1932	101	100½ 102½
Northern States Power 5s	1941	95½	93 96½
6s	1941	95½	103 105½
Ohio Power 7s	1951	106½	106½ 107½
Pacific Gas & Electric 5s	1942	94½	93½ 96
Pennsylvania Water & Power 5s	1940	100	99½ 101
‡Philadelphia Electric 5s	1966	100½	100¼ 102
5½s	1947	104½	103½ 105
6s	1941	107	106 107½
Portland Electric Power 6s	1947	97⅞	94 99½
Southern California Edison 5s	1939	99	99 100½
6s	1944	103½	102½ 104½
Tennessee Electric Power 6s	1947	101⅞	99½ 102½
Texas Power & Light 5s	1937	96½	97 98
Toledo Edison 7s	1941	110	108½ 110
Utah Power & Light 5s	1944	94	91 95½
Holding Companies			
Alabama Traction, Light & Power 5s	1962	86½	86 87½
American Gas & Electric 6s	2014	96½	96½ 97
American Power & Light 6s	2016	95	94 95½
Amer. Water Works & Electric 5s	1934	95½	92½ 96½
Associated Gas & Electric 6½s	1954	a100	... ...
Central Indiana Power 6s	1947	98	95½ 98½
Commonwealth Power 6s	1947	100½	97⅞ 101
Consolidated Cities Lt., Pwr. & Tr. 5s	1962	79½	75½ 80½
Illinois Power & Light 6s	1953	101½	100½ 102
United Light & Railways 5s	1932	95	93½ 95
6s	1952	98½	95½ 99½
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing	105	103½	107
Worthington Pump & Machinery B	a 71	70½	76½
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 81	71½	86½
American Bosch Magneto—no par	a 27½	26½	54½
Electric Storage Battery—no par	a 63¾	61¾	70½
General Electric	a265½	227½	320
General Electric—10	a 11½	11	11½
*Hurley Machine—no par	45	41½	56
†Wagner Electric	36	26½	50
Westinghouse Electric & Manufacturing—50	a 68	66½	84
Worthington Pump & Machinery	a 49½	46	79½
BONDS			
Canadian General Electric 6s	1942	107½	107⅜ 107⅜
General Electric 3½s	1942	82½	82½ 84
5s	1952	103	101½ 105½
Robbins & Myers 7s	1952	67	67 73½
Wagner Electric Mfg 7s	1931	100½	100½ 101½
Western Electric 5s	1944	98½	98 99½
Westinghouse Electric & Mfg 7s	1931	107½	107½ 108½

*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price, low and high, Tuesday, March 24.